

161155

FEASIBILITY STUDY ADDENDUM

**Lenz Oil Site
Lemont, Illinois**

OCTOBER 1997
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CONESTOGA-ROVERS & ASSOCIATES

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EXECUTIVE SUMMARY

The Lenz Oil Superfund Site (Site), located near Lemont, Illinois, is a former oil transfer and storage facility on 4.9 acres located at Jeans Road and Route 83. An additional area located south of Jeans Road has been impacted by past Lenz Oil operations. Figure ES-1 provides a Site drawing.

In the late 1980s, the Illinois Environmental Protection Agency (IEPA) conducted remedial activities which involved removal of waste, tanks, drums, and other facilities. IEPA's remedy included the removal and on-Site incineration of approximately 21,000 tons of contaminated soil and light non-aqueous phase liquid (LNAPL). The IEPA also installed an alternate water supply for local residents.

Following the IEPA remedial activity, a Remedial Investigation/Feasibility Study (RI/FS) was conducted for the Site by a group of PRPs (PRP Group) pursuant to an Administrative Consent Order. The RI/FS was focused on characterizing remaining soil, LNAPL, and groundwater contamination. A further evaluation of the LNAPL was conducted in 1994.

In the summer of 1997, oil was observed in a private well (not used for potable use) at the Williams residence. This finding, along with measurements from existing monitoring wells and piezometers indicated that the LNAPL area defined by the RI/FS was larger than originally estimated, perhaps significantly impacting not only the cost of remedial alternatives, but the selection of an appropriate remedy. To address these concerns, the PRP Group agreed to conduct a Supplemental LNAPL Investigation.

The Supplemental LNAPL Investigation involved the installation of nine boreholes and six piezometers, four rounds of water level/LNAPL thickness, bail down tests, and groundwater sample collection and analysis.

The results of the Supplemental LNAPL Investigation show:

1. The LNAPL area is approximately 67,000 square feet, as shown on Figure ES-1. This area is approximately 70 percent larger than the area identified during the RI/FS.
2. The estimated true thickness of LNAPL averages ranges from 0.2 to 1.6 feet thick and is considerably less than the apparent thickness.
3. The water table has fluctuated significantly due to varying recharge and has caused a smear zone (vertical zone with LNAPL residual) averaging approximately 3.5 feet thick within the LNAPL area.
4. High-pressure petroleum pipelines are located in close proximity to the western edge of the LNAPL area but do not appear to be a LNAPL source.
5. Groundwater samples collected from monitoring wells located downgradient of the LNAPL area did not detect volatile organic compounds (VOCs), which suggests that the dissolved component of LNAPL in the groundwater is minor and is attenuated within a short distance of the LNAPL area.

Five remedial alternatives were evaluated using the information from the FS and incorporating the latest findings of the Supplemental LNAPL Investigation. This FS Addendum excludes the remediation of contaminated soils known as the 10⁻⁴ area. Based on an updated risk assessment evaluation, USEPA excluded remediation in these areas.

The five remedial alternatives are:

- Alternative 2 - Passive LNAPL Collection: Alternative 2 would involve the installation of four collection trenches designed to recover LNAPL without the need for groundwater extraction. Passive collection is expected to remove all of the mobile LNAPL. Residual LNAPL would be naturally contained by the geologic formation. Alternative 2 would also involve natural attenuation of groundwater, deed restrictions, and monitoring.

- Alternative 5A - Seasonal Active LNAPL Collection: Alternative 5A would involve the installation of four collection trenches designed to recover LNAPL by pumping groundwater from each trench two months per year during low water table conditions. The groundwater pumping would lower the water table to enhance LNAPL recovery. Seasonal operation would be conducted in recognition that LNAPL collection during high water table conditions would be minimal and ineffective. During predesign studies, the effectiveness of vacuum enhanced recovery (VER) would be evaluated as an innovative technology for active LNAPL collection to be used in place of a conventional trench system. Alternative 5A also includes natural attenuation of groundwater, deed restrictions and monitoring, as well as a groundwater extraction system as a contingency measure.
- Alternative 5B - Year-Round Active LNAPL Collection: Alternative 5B modifies Alternative 5A by operating the active LNAPL collection system year-round and includes a contingency for a downgradient pump and treat system to address dissolved VOCs (if present) using five extraction wells. As in Alternative 5A, VER would be evaluated during predesign studies.
- Alternative 5B includes attenuation of groundwater, deed restrictions and monitoring.
- Alternative 9A - Excavation and Solidification/Stabilization: Alternative 9A involves the excavation of LNAPL affected soils and bedrock from the smear zone. Excavated soil and bedrock would be treated using a solidification/stabilization pugmill designed to bind contaminants into a solidified matrix. The stabilized soil and rock would be used as backfill. Alternative 9A also includes deed restrictions and monitoring plus a contingency for a downgradient pump and discharge system to address dissolved VOCs (if present) using five extraction wells.
- Alternative 9B - Excavation and Low Temperature Thermal Treatment (LTTT): Alternative 9B modifies Alternative 9A by replacing solidification/stabilization with low temperature thermal treatment (LTTT). Treated soil would be backfilled. Alternative 9B also includes deed

restrictions and monitoring, as well as a pump and discharge system as a contingency measure.

Table ES-1 provides a summary of each alternative and a nine criteria evaluation.

TABLE ES-1
NINE CRITERIA EVALUATION
LENZ OIL SITE - LEMONT, ILLINOIS

<i>Nine Criteria</i>	<i>Alternative 2 Passive LNAPL Collection</i>	<i>Alternative 5A Seasonal Active LNAPL Collection</i>	<i>Alternative 5B Year Round Active LNAPL Collection</i>	<i>Alternative 9A Excavation and Solidification/Stabilization (S/S)</i>	<i>Alternative 9B Excavation and Low Temperature Thermal Treatment</i>
1. Overall Protection of Human Health and the Environment	Lateral migration of LNAPL would be prevented. Deed restrictions would prevent contact with residual LNAPL. Natural attenuation would address dissolved groundwater contamination with groundwater recovery as a contingency measure.	Alternative 5A provides the same protective features as Alternative 2, but enhances LNAPL recovery through active collection. Natural attenuation would address dissolved groundwater contamination with Groundwater recovery as a contingency measure.	Alternative 5B provides the same protective features as Alternatives 2 and 5A, but attempts to improve LNAPL recovery by year round operation. A groundwater pump and discharge system adds protection of groundwater as a contingency measure.	Alternative 9A provides protection by excavating LNAPL and soil/rock from the smear zone. Post-excavation monitoring is required to ensure effective removal. Deed restrictions are required to prevent contact with stabilized soil and rock. Groundwater recovery is available as a contingency measure.	Alternative 9B provides the same protective features as Alternative 9A, but uses LTTT instead of S/S for treatment. Deed restrictions would still be required for LNAPL too deep to be excavated.
2. Compliance with ARARs	ARAR compliant. RCRA/TSCA requirements would be met for off-Site shipment of soil/rock and recovered LNAPL excavated during trench construction.	ARAR compliant. RCRA/TSCA requirements would be met for off-Site shipment of excavated soil/rock and recovered LNAPL. IEPA and local approvals required for groundwater discharge to POTW.	ARAR compliant. Same as Alternative 5A.	ARAR compliant.	ARAR compliant.
3. Long-Term Effectiveness and Permanence	Trenches prevent LNAPL migration. Natural attenuation or groundwater extraction protects groundwater. Deed restrictions and long-term monitoring address residual LNAPL.	Same as Alternative 2, but provides more LNAPL removal.	Same as Alternatives 2 and 5A, but attempts to increase LNAPL recovery by year round operation. Groundwater is protected by natural attenuation or a Groundwater recovery contingency.	Effective removal of LNAPL. Some LNAPL below the water table may be impractical to excavate due to dewatering limitations. Stabilized soil/rock would be used as backfill. Groundwater recovery is available as a contingency measure if natural attenuation is not effective.	Same as Alternative 9A, except that thermally treated soil/rock would be backfilled.
4. Reduction in Toxicity, Mobility, and Volume (TMV) through Treatment	Reduction in LNAPL through recovery and off-Site incineration. Reduction in dissolved groundwater contamination through natural attenuation or groundwater extraction. Passive LNAPL collection is expected to remove 10 percent to 20 percent of LNAPL.	Same as Alternative 2, but provides greater reduction in TMV by greater LNAPL recovery. Active LNAPL collection is expected to recover 30 percent to 50 percent of LNAPL.	Same as Alternatives 2 and 5A, but attempts to increase LNAPL recovery by year round operations. Dissolved contamination is reduced by natural attenuation or a Groundwater recovery system as a contingency measure. Active LNAPL collection is expected to recover 30 percent to 50 percent of LNAPL.	Reductions in LNAPL through removal. Stabilization process would volatilize VOCs which would be treated as an off-gas. Groundwater recovery is available as a contingency measure if natural attenuation is not effective.	Same as Alternative 9A, except that thermal treatment provides a greater reduction in TMV..
5. Short-Term Effectiveness	Construction of trenches would be disruptive to local residents, business and traffic along Jeans Road. Worker protection would be required during trench construction. Short-term construction with long-term operation (30 years).	Same as Alternative 2. However, operation would be 10 years for Alternative 5A versus 30 years for Alternative 5B.	Same as Alternatives 2 and 5A, except operation would be over 30 years.	Excavation would be highly disruptive to local residents, business, and traffic along Jeans Road. Williams' house would be demolished. Worker protection and safety measures required prevent off-Site migration during excavation. Short-term construction (1 year) and long-term monitoring (30 years). Long-term Groundwater recovery is available as a contingency measure.	Same as Alternative 9A.

TABLE ES-1
NINE CRITERIA EVALUATION
LENZ OIL SITE - LEMONT, ILLINOIS

<i>Nine Criteria</i>	<i>Alternative 2 Passive LNAPL Collection</i>	<i>Alternative 5A Seasonal Active LNAPL Collection</i>	<i>Alternative 5B Year Round Active LNAPL Collection</i>	<i>Alternative 9A Excavation and Solidification/Stabilization (S/S)</i>	<i>Alternative 9B Excavation and Low Temperature Thermal Treatment</i>
6. Implementability	Remedy employs standard construction and dewatering procedures. Excavation into bedrock could be difficult. Natural attenuation would be demonstrated through monitoring.	Same as Alternative 2.	Same as Alternatives 2 and 5A. Groundwater pump and discharge is common technology and would replace natural attenuation as a contingency measure.	Excavation and dewatering is a commonly employed construction technique. Excavation of bedrock is feasible if bedrock is weathered and difficult if bedrock is competent. Dewatering may prove impractical in fractured bedrock if fractures allow large inflow to excavation.	Same as Alternative 9A.
7. Cost:					
Base Cost	\$4.6 M	\$8.7 M	\$14.3 M	\$11.0 M	\$17.1 M
Groundwater Contingency	<u>\$1.3 M</u>	<u>\$1.3 M</u>	<u>\$1.0 M</u>	<u>\$1.3 M</u>	<u>\$1.3 M</u>
Total	\$5.9 M	\$10.0 M	\$15.3 M	\$12.3 M	\$18.4 M
8. Community Acceptance	To be determined	To be determined	To be determined	To be determined	To be determined
9. IEPA Acceptance	To be determined	To be determined	To be determined	To be determined	To be determined

1.0 INTRODUCTION

The Lenz Oil Superfund Site (Site), located near Lemont, Illinois, is a former oil transfer and storage facility which consists of 4.9 acres located at Jeans Road and Route 83. An additional 5-acre area located south of Jeans Road has been impacted by past Lenz Oil operations. Figure 1.1 locates the Site and Figure 1.2 presents a Site drawing.

In the late 1980s, the Illinois Environmental Protection Agency (IEPA) conducted remedial activities which involved removal of waste, tanks, drums, and other facilities. IEPA's remedy included the removal and on-Site incineration of approximately 21,000 tons of contaminated soil and light non-aqueous phase liquid (LNAPL). The IEPA also installed an alternate water supply for local residents.

Following the IEPA remedial activity, a Remedial Investigation/Feasibility Study (RI/FS) was conducted by the PRP Group pursuant to an Administrative Consent Order. The RI/FS was focused on characterizing remaining contamination present in soil, LNAPL and groundwater. A specific evaluation of the LNAPL was conducted in 1994.

In the summer of 1997, oil was observed in a private well (not used for potable use) at the Williams residence. This finding, along with measurements from existing monitoring wells and piezometers indicated that the LNAPL area defined by the RI/FS was larger than originally estimated, perhaps significantly impacting not only the cost of remedial alternatives, but the selection of an appropriate remedy. To address these concerns, the PRP Group agreed to conduct a Supplemental LNAPL Investigation which is summarized in Section 2.1 of this report.

The PRP Group retained Conestoga-Rovers & Associates (CRA) to conduct the Supplemental LNAPL Investigation and update FS alternatives in accordance with CRA's scope of work presented in a letter to the USEPA dated August 29, 1997. This report presents an FS Addendum which

updates and modifies FS Alternatives 2, 5, and 9 based on the Supplemental LNAPL Investigation.

2.0 BACKGROUND

2.1 SUPPLEMENTAL LNAPL INVESTIGATION SUMMARY

The results of the Supplemental LNAPL Investigation are presented in a separate report (CRA, 1997). A summary of this investigation is presented in the following paragraphs.

A Supplemental LNAPL Investigation was conducted to update the extent of LNAPL not removed by the IEPA remedial program, update LNAPL smear zone thickness, evaluate whether high pressure petroleum pipelines in the vicinity of the Site are contributing to Site contamination and to further characterize volatile organic compounds (VOCs) may be present in groundwater downgradient of the LNAPL area.

Based on information collected from nine new boreholes, six new piezometers, and monitoring at 42 existing well locations, CRA estimated that the LNAPL Area covers 67,000 square feet. The area is shown as a shaded area on Figure 1.2 of Section 1. This area is approximately 70 percent larger than measured during the 1994 LNAPL Investigation.

The estimated true thickness of LNAPL within the soil/bedrock formation ranges from 0.2 feet to 1.6 feet on average and is considerably less than the apparent thickness. The soil/bedrock above and below the water table has been contaminated by the repeated rise and fall of the water table. This area is known as the smear zone. Based on historical water table fluctuations, CRA estimates that the smear zone averages 3.5 feet over the LNAPL area.

During the Supplemental Investigation, three samples of LNAPL were collected and fingerprinted and have shown that the LNAPL is a mixture of motor oil and diesel fuel with VOCs. Some LNAPL was also found to contain gasoline and some samples appear to be only 2 to 7 years old which suggests a source other than Lenz Oil. For this reason, nine boreholes and one piezometer were drilled along high pressure petroleum pipelines located on the

western edge of the LNAPL area. These boreholes found low levels of petroleum-related compounds, but did not identify any significant release from the pipelines. Hence, there are currently no known sources to the LNAPL other than Lenz Oil.

The Supplemental LNAPL Investigation also evaluated VOCs downgradient of the LNAPL area. VOCs were not detected within piezometers located immediately downgradient of the LNAPL area. This supports the conclusion that the VOCs in the LNAPL do not readily dissolve into the groundwater and that dissolved VOCs dissipate as a result of natural attenuation.

Incidental work conducted as part of the Supplemental LNAPL Investigation shows:

- no evidence of LNAPL discharge along the northern bank of the Des Plaines River;
- that the Williams' well has been abandoned in accordance with DuPage County Department of Health requirements;
- that levels of VOCs in Mrs. Williams' basement, existing before the well was abandoned were negligible.

USEPA and IEPA required that the Supplemental LNAPL Investigation Report and FS Addendum be submitted prior to the completion of all of the monitoring rounds required as part of the work plan for the investigation. The expectation is that additional data will confirm and support the conclusions presented herein.

2.2 VACUUM ENHANCED RECOVERY (VER)

CRA has identified VER as a promising and innovative technology which could be used in place of a conventional trench collection

system. Within the FS Addendum, the possibility of using the VER technology is incorporated into Alternatives 5A and 5B. A summary of how VER works is presented in the following paragraphs.

VER systems are designed to recover LNAPL, via vacuum-enhanced pumping, while simultaneously initiating the remediation of the vadose zone soils via vapor extraction and bioventing. In most applications, a single aboveground vacuum pump can be plumbed to multiple extraction wells to extract LNAPL, and soil gas in the same process stream. LNAPL recovery is enhanced by the vacuum-induced gradient, which increases the rate of fluid flow into extraction wells.

The two major advantages of the VER technology are

1. the increased migration of LNAPL to the recovery well as a consequence of the steeper hydraulic gradient created by the vacuum; and
2. enhanced cleanup of the vadose zone (smear zone) above the water table as a result of vapor extraction and bioventing processes.

A typical system set-up and flow chart is presented in Figure 2.1. These enhancements result in an expedited cleanup of LNAPL. As a result of the extraction of vapor from soils at the VER wells, bioventing processes are commonly initiated within the smear zone away from the VER well. The bioventing process can be further enhanced with the application of air injection at locations between the VER wells.

A number of successful LNAPL cleanups have been completed using the VER technology because it has been in place for a number of years. Traditional dewatering, "well-point" systems (which are based upon vacuum extraction of groundwater) have been used at petroleum refineries to control LNAPL plumes since at least the 1970s. More recent research and case studies have further demonstrated the effectiveness of these VER systems (Kittel, 1995; Hockman, 1992; Trowbridge, 1992; and Kittel, 1994).

3.0 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

This section provides an updated evaluation of alternatives originally presented in the FS (ERM, 1997).

Based on an updated evaluation of risk for the on-Site soils (known as the 10⁴ area) the USEPA has determined that remediation for this area is no longer required. Hence, ERM's alternatives have been modified to exclude remedial components associated with on-Site soils. Specifically, Alternative 2 no longer includes a multilayer cap or fence, Alternatives 5A and 5B do not include excavation of on-Site soils for off-Site landfill disposal, and Alternatives 9A and 9B do not include the volume of on-Site soils for treatment.

Each alternative has been updated to take into account the results of the studies discussed in Section 2 of this report. The finding of a larger LNAPL area has increased the cost of some remedial alternatives. Also, the recognition that LNAPL removal efficiency is significantly enhanced during low water table conditions has prompted the introduction of a modified alternative (Alternative 5A) for consideration where LNAPL recovery would be conducted seasonally.

The evaluation of alternatives utilizes the nine criteria evaluation presented in the FS. As such, the evaluation of each alternative against the nine criteria is not repeated. Instead, a summary of the nine criteria evaluation is presented in Table 3.1 and the costs of each alternative are provided in detail here in this FS Addendum.

3.1 ALTERNATIVE 2 - PASSIVE LNAPL RECOVERY

Figures 3.1 and 3.2 present Alternative 2 which consists of four trenches designed to recover LNAPL without pumping groundwater. Alternative 2 also includes deed restrictions to prevent excavation of soil and the use of groundwater, groundwater monitoring, and natural attenuation of groundwater. Groundwater extraction via five wells is included under

Alternative 2 as a contingency measure should natural attenuation prove to be ineffective.

3.1.1 Passive LNAPL Recovery

Figure 3.1 shows the location of the four trenches which will be used to recover LNAPL. Each of these trenches would be approximately 250 feet long and 3 feet wide. The depth would range from 12.5 to 14.5 feet deep and would contain gravel throughout the thickness. The construction of the trenches may require dewatering unless a trenchless technology can be utilized. The specifics of the trench installation would be developed during the remedial design. The cost estimate assumes that dewatering will be required for construction of the trenches. This water would require treatment using a temporary treatment facility with discharge to the local public owned treatment works (POTW) sewer system. The temporary groundwater treatment system for construction of the passive collection trenches would consist of oil/water separation, filtration, and carbon adsorption.

Soils excavated during trench construction situated above the smear zone would be managed as clean soils and would be used as backfill or regrading on Site. Soils excavated from the smear zone would be managed as hazardous waste and would be either treated on Site or shipped to an off-Site RCRA Subtitle C facility.

The cross-section of the passive collection trenches are presented on Figure 3.2. This system is designed to allow LNAPL to accumulate in the collection system for periodic, manual removal using oil skimmer pumps.

LNAPL would be pumped from sumps into 55-gallon drums for shipment to a TSCA/RCRA treatment facility.

The construction of the passive collection trenches would require the demolition of the buildings located east of the Williams' house. It is intended that Alternative 2 would be conducted without impacting the Williams'

house. The cost estimate assumes that the buildings demolished would be reconstructed and that the collection system would be constructed below grade to facilitate ongoing use of the property.

The southernmost passive collection trench would be installed at the downgradient perimeter of the LNAPL area. This trench would be designed with a synthetic barrier designed to prevent the horizontal migration of LNAPL. The synthetic membrane would be placed against the southern trench wall and would not be keyed into any underlying low permeable layer so that groundwater could continue to migrate around and beneath the LNAPL collection trench, while any LNAPL would be trapped within the collection system.

The passive LNAPL collection system is expected to prevent lateral LNAPL migration. The passive collection system will not remove all of the LNAPL. Passive collection systems typically remove 10 percent to 20 percent of LNAPL. The lateral migration of LNAPL will be prevented by the passive collection system which is critical to the remedy. The residual LNAPL will be trapped within the soil and weathered bedrock. Infiltration and groundwater would continue to contact the residual LNAPL causing some leaching to groundwater. However, Alternative 2 takes advantage of natural attenuation to provide ongoing remediation of any dissolved constituents migrating from the LNAPL to the groundwater system.

3.1.2 Natural Attenuation

Groundwater flows in a southerly direction towards the Des Plaines River. Infiltration and groundwater table fluctuations currently allow contact between the groundwater system and the LNAPL present at the Site within the smear zone. Studies conducted to date have demonstrated that the contamination is strongly associated with the LNAPL, rather than the groundwater system. Monitoring wells situated immediately downgradient and beneath the LNAPL layer show a lack of contamination from leaching of LNAPL to the groundwater system. To date, there is no evidence of a dissolved VOC

plume downgradient from the LNAPL area. This phenomena is attributed to a condition where the contaminants prefer to remain within the LNAPL and are hydrophobic. The small amounts of contaminants which dissolve to the water are naturally attenuated within a short distance of the LNAPL area (See Section 4.7 of the Supplemental LNAPL Investigation for a more detailed discussion on natural attenuation).

3.1.3 Groundwater Extraction

Alternative 2 would also involve, as a contingency measure, the installation of five groundwater extraction wells located to the south of the LNAPL area (Figure 3.1). These wells would be designed to collect a total of 15 gpm. This water would be discharged to the POTW without pretreatment.

It is important to note that data collected to date shows that there is not a VOC plume present downgradient from the LNAPL area. As such, the need for the groundwater collection and discharge system would need to be determined during predesign studies. Should predesign studies verify the absence of a VOC plume, the plume remediation contingency would not be implemented.

3.1.4 Monitoring

Alternative 2 involves the ongoing monitoring of the passive collection system and monitoring wells. The wells selected for long-term monitoring will be determined during the remedial design. For cost estimating purposes, it has been assumed that 15 wells will be sampled on a semi-annual basis for TCL/TAL parameters. The long-term monitoring program would include parameters needed to demonstrate natural attenuation.

3.1.5 Deed Restriction

Alternative 2 includes the placement of deed restrictions on the affected properties which would prohibit excavation and the use of groundwater. It is expected that surficial land use as a brownfield development could be pursued as long as land use is compatible with deed restrictions.

3.1.6 Updated Cost Estimate

Table 3.2 presents a cost estimate for revised Alternative 2. A breakdown of costs is presented in Appendix A.

3.1.6 Nine Criteria Evaluation

An evaluation against Superfund's nine criteria was presented in detail within the original FS. A summary is presented here in Table 3.1.

3.2 ALTERNATIVE 5A - SEASONAL ACTIVE LNAPL RECOVERY-SEASONAL

Alternative 5A modifies the original FS Alternative 5 by taking advantage of periodic low water table conditions to enhance LNAPL recovery. Alternative 5A would consist of the installation of four active collection trenches located throughout the LNAPL area. Groundwater collection would be conducted at the trenches to lower the water table and enhance LNAPL recovery. Under Alternative 5A, vacuum enhanced recovery (VER) would be evaluated during predesign studies as a substitute technology providing active LNAPL recovery which may be more efficient.

Downgradient groundwater collection presented in the original Alternative 5 would not be conducted under Alternative 5A. Instead,

groundwater would be naturally attenuated as demonstrated through a long-term monitoring program. Downgradient groundwater collection is included as a contingency measure should natural attenuation not be effective. Alternative 5A would also include deed restrictions.

3.2.1 Seasonal Active LNAPL Recovery

Figure 3.3 presents the location of the active collection trenches. Figure 3.2 presents a typical cross-section of the trenches. The trenches would be installed in a manner similar to the passive collection trenches. Soil excavated above the smear zone would be managed as clean soils and used as backfill or regrading soils on Site. Soils excavated from the smear zone would be managed as RCRA hazardous waste and would be treated on Site or sent to an off-Site RCRA facility. Dewatering would be required for the installation of the collection trenches unless a trenchless technology could be employed. Under Alternative 5A, a permanent groundwater treatment facility would be constructed consisting of oil/water separation, filtration followed by carbon treatment with final discharge to a POTW. An active groundwater collection system would be designed to be operated approximately two months per year to coincide with low water table conditions. Studies have shown that the LNAPL accumulation is significantly greater during low water table conditions. LNAPL thins or disappears during high water table conditions, making LNAPL recovery ineffective for most of the year. The system would be designed so that individual trenches could be operated independently. This would allow recovery from trenches where LNAPL is present while keeping other trenches idle.

Alternative 5A assumes that LNAPL recovery would be negligible after 10 years (whereas Alternative 5B estimates costs over 30 years). The active LNAPL collection system will prevent lateral LNAPL migration. Active LNAPL collection typically removes between 30 percent and 50 percent of LNAPL.

3.2.2 Vacuum Enhanced Recovery (VER)

The goal of Alternative 5A is to effectively remove as much LNAPL as practical. CRA has identified VER as an innovative technology which could meet this goal with more success compared to a conventional trench system with greater efficiency and lower cost. Therefore, Alternative 5A includes the evaluation of VER during predesign studies. If a VER extraction system proves to be more effective than the conventional trench system, then VER would be used as a substitute.

3.2.3 Natural Attenuation

Not all of the LNAPL would be recovered by any collection system. The LNAPL which remains will be trapped as a residual within the soil and weathered bedrock system. As discussed in Section 3.1, the contaminants within the LNAPL have a strong affinity to remain within the LNAPL and are hydrophobic such that the amount of VOCs that dissolve to groundwater is minor. In addition, a VOC plume is not present downgradient of the LNAPL area which demonstrates the strong natural attenuation abilities of the aquifer system.

Under Alternative 5A, the small amount of VOCs which dissolve from the residual LNAPL to the groundwater system would be naturally attenuated or if natural attenuation proves to be ineffective by groundwater extraction.

3.2.4 Groundwater Extraction

Alternative 5A would also involve, as a contingency measure, the installation of five groundwater extraction wells located to the south of the LNAPL area (Figure 3.3). These wells would be designed to collect a total of 15 gpm. This water would be discharged to the POTW without pretreatment.

It is important to note that data collected to date shows that there is not a VOC plume present downgradient from the LNAPL area. As such, the need for the groundwater collection and discharge system would need to be determined during predesign studies. Should predesign studies verify the absence of a VOC plume, the plume remediation contingency would not be implemented.

3.2.5 Long-Term Monitoring

Alternative 5A involves the ongoing monitoring of the active collection system and monitoring wells. The wells selected for long-term monitoring would be determined during the remedial design. For cost estimating purposes, it has been assumed that 15 wells will be sampled semi-annually for TCL/TAL parameters.

The long-term monitoring program would include parameters needed to demonstrate natural attenuation.

3.2.6 Deed Restrictions

Alternative 5A includes the placement of deed restrictions on the affected properties which would prohibit excavation and the use of groundwater. It is expected that surficial land use as a brownfield development could be pursued as long as land use is compatible with deed restrictions.

3.2.7 Cost Estimate

Table 3.3 presents a cost estimate summary for Alternative 5A. A breakdown of costs is presented in Appendix A.

All of Which is Respectfully Submitted,

CONESTOGA-ROVERS & ASSOCIATES

A handwritten signature in cursive script, appearing to read 'Ron Frehner'.

Ronald Frehner

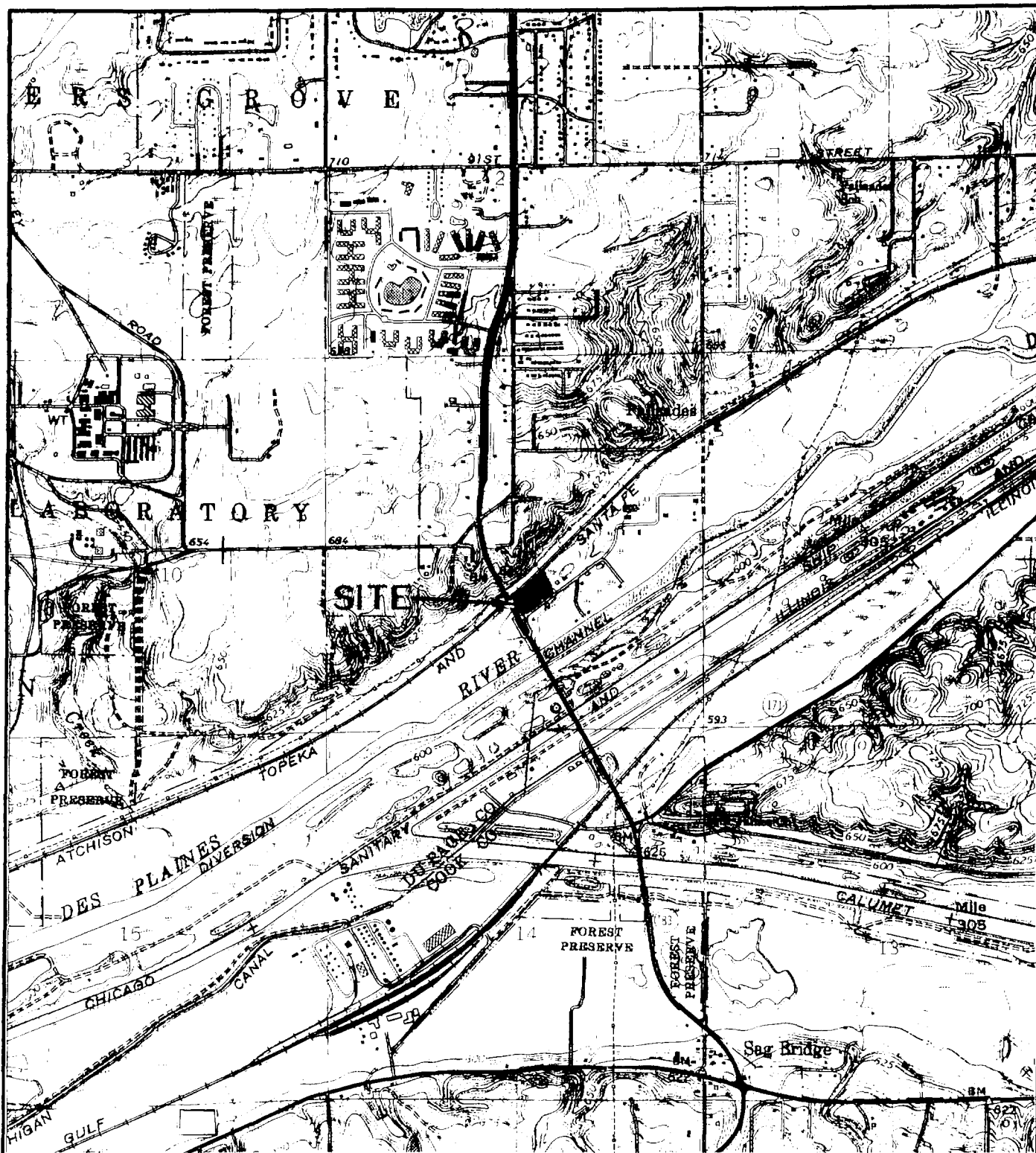
A handwritten signature in cursive script, appearing to read 'Phil Harvey'.

Phil Harvey

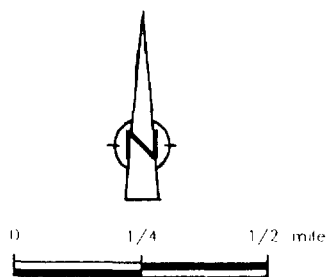
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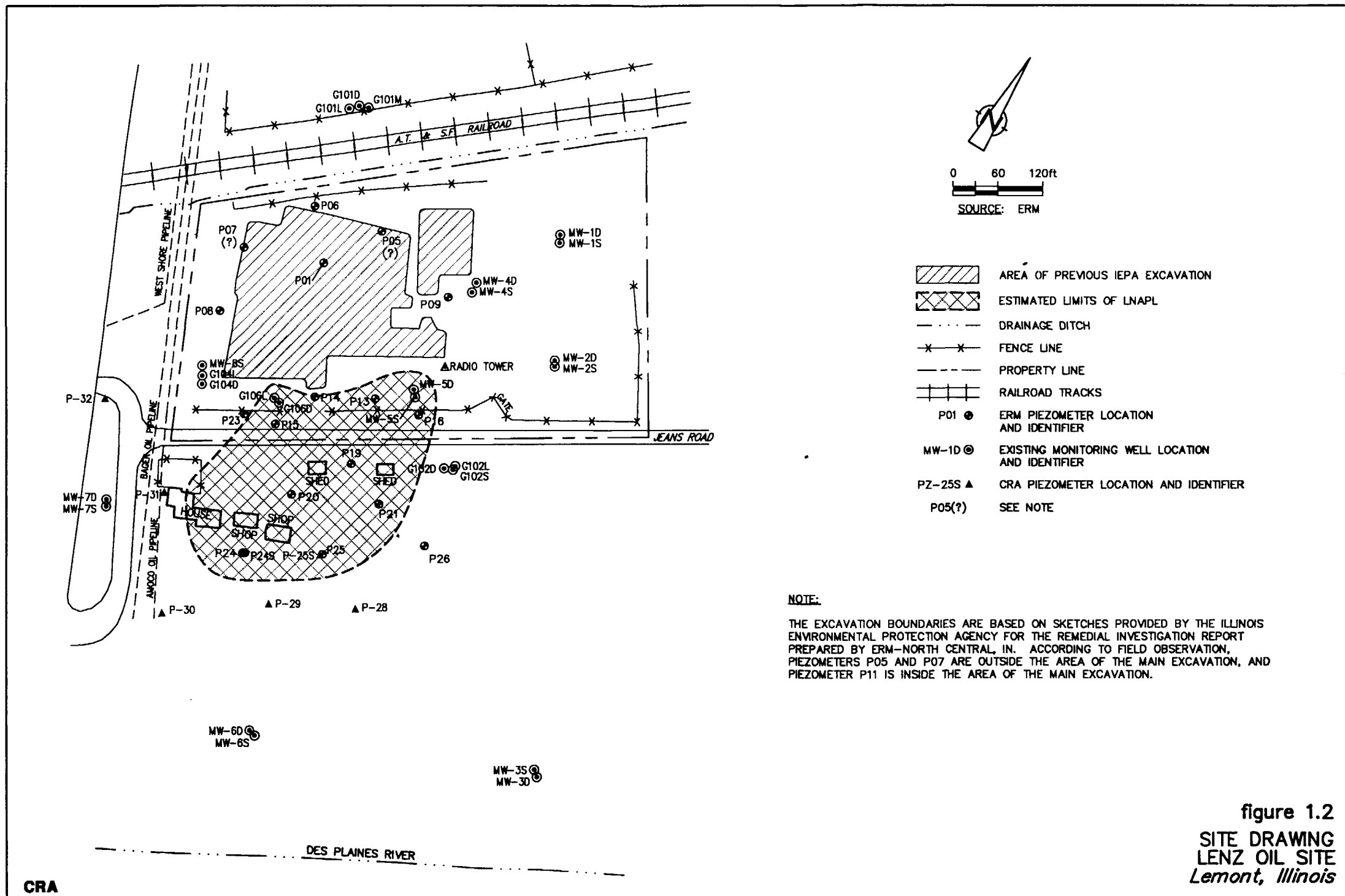
BASE SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE;
SAG BRIDGE, ILL. 1978



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figure 1.1
SITE LOCATION
LENZ OIL SITE
Lemont, Illinois



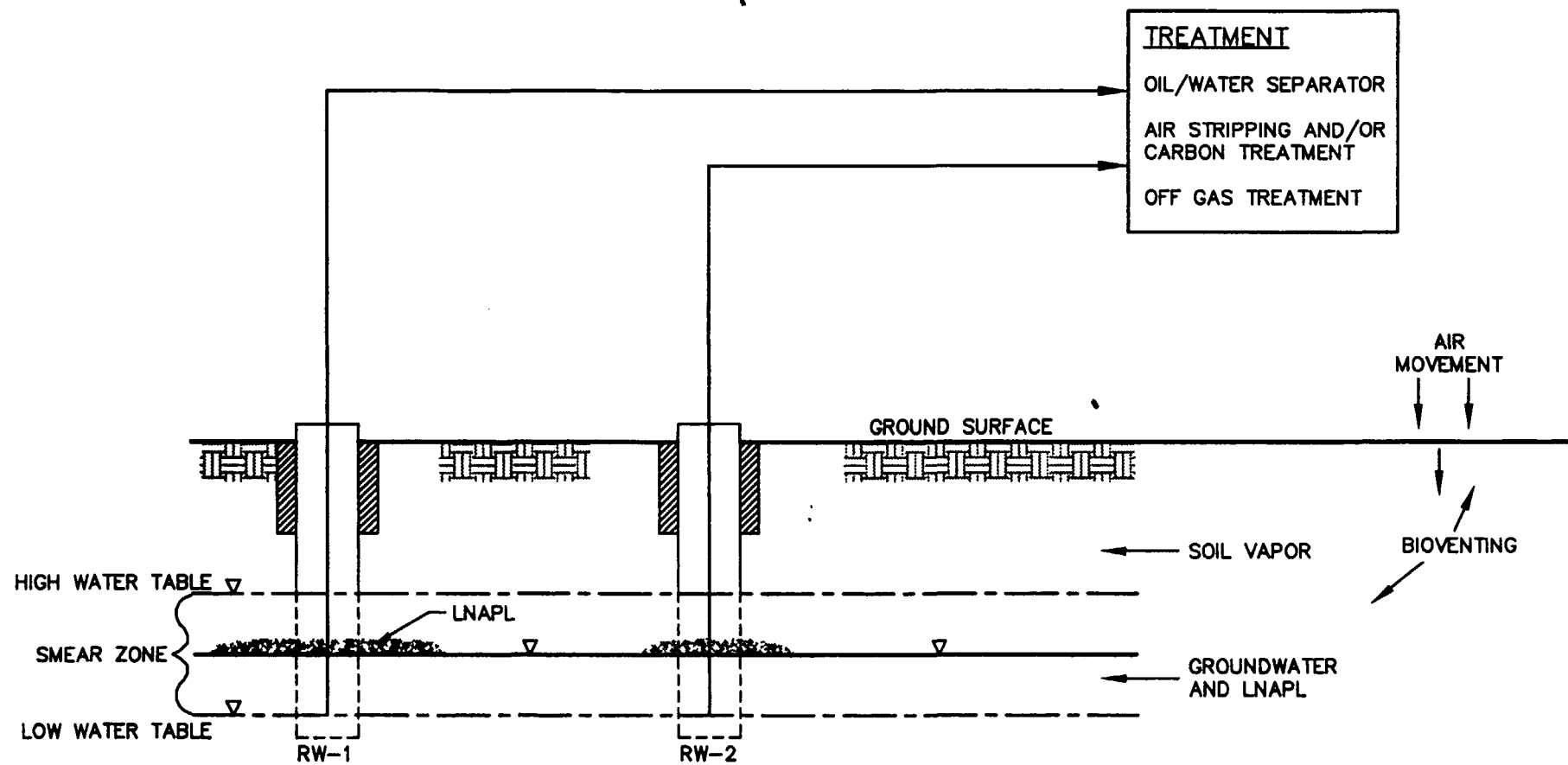
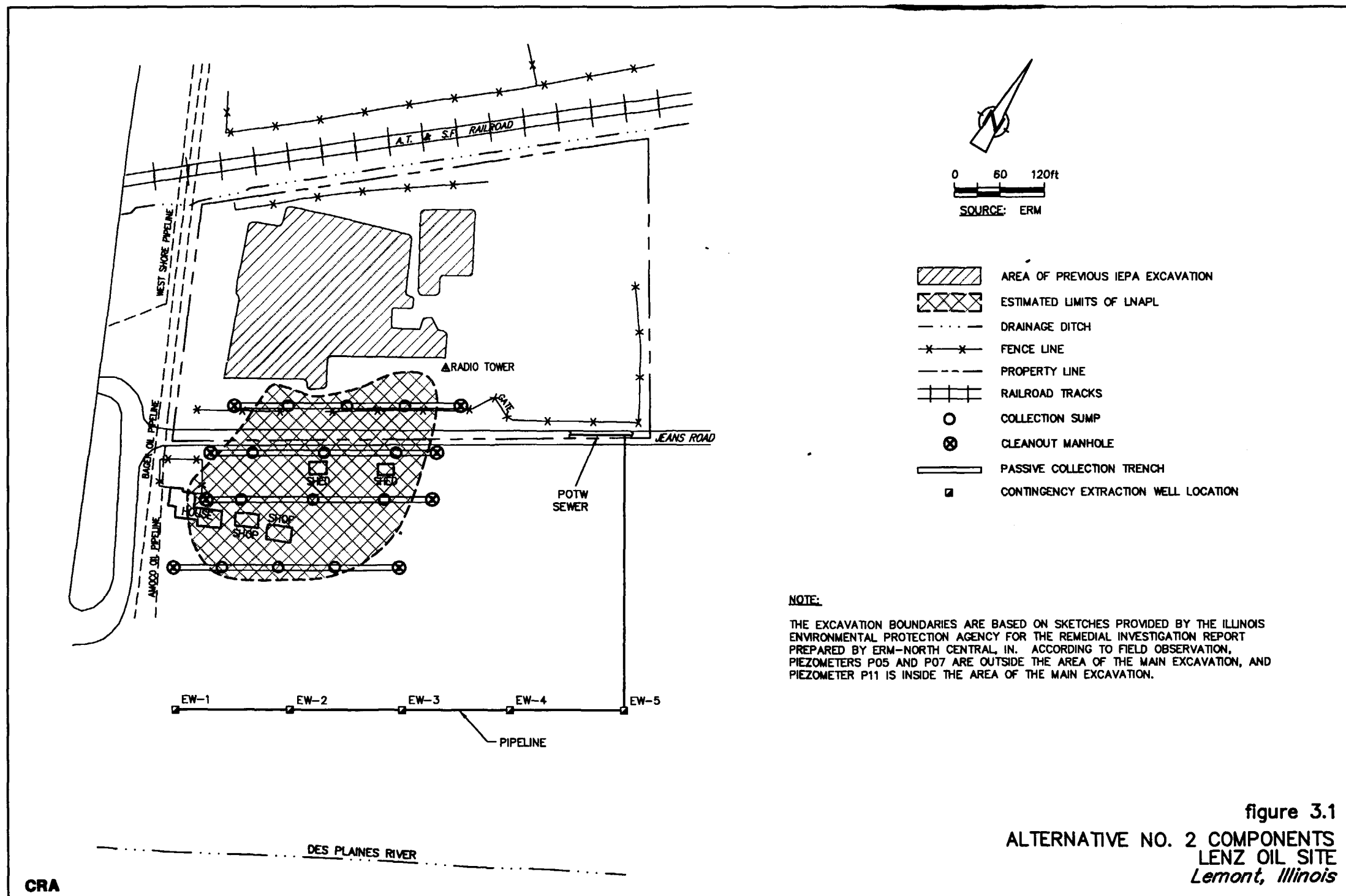
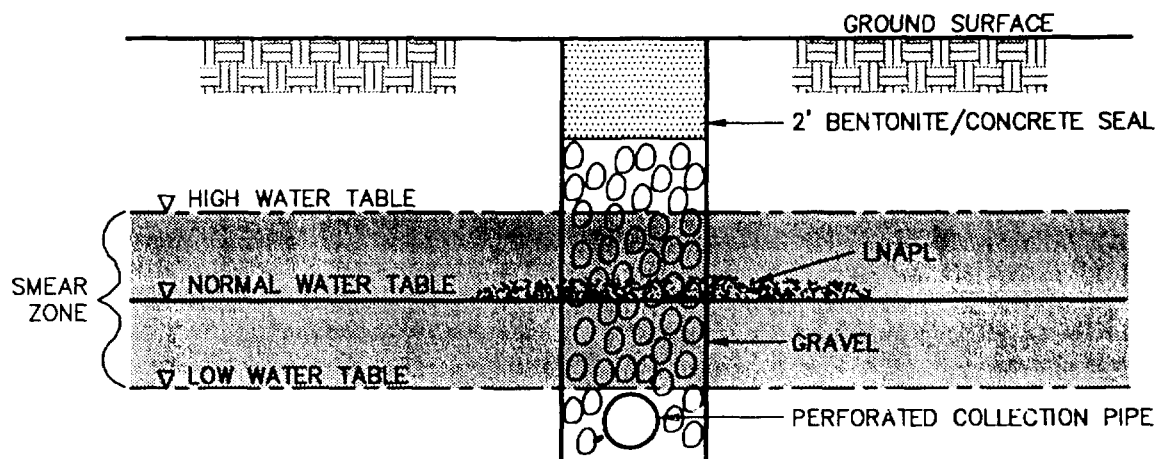


figure 2.1
 VACUUM ENHANCED RECOVERY SCHEMATIC
 LENZ OIL SITE
 Lemont, Illinois

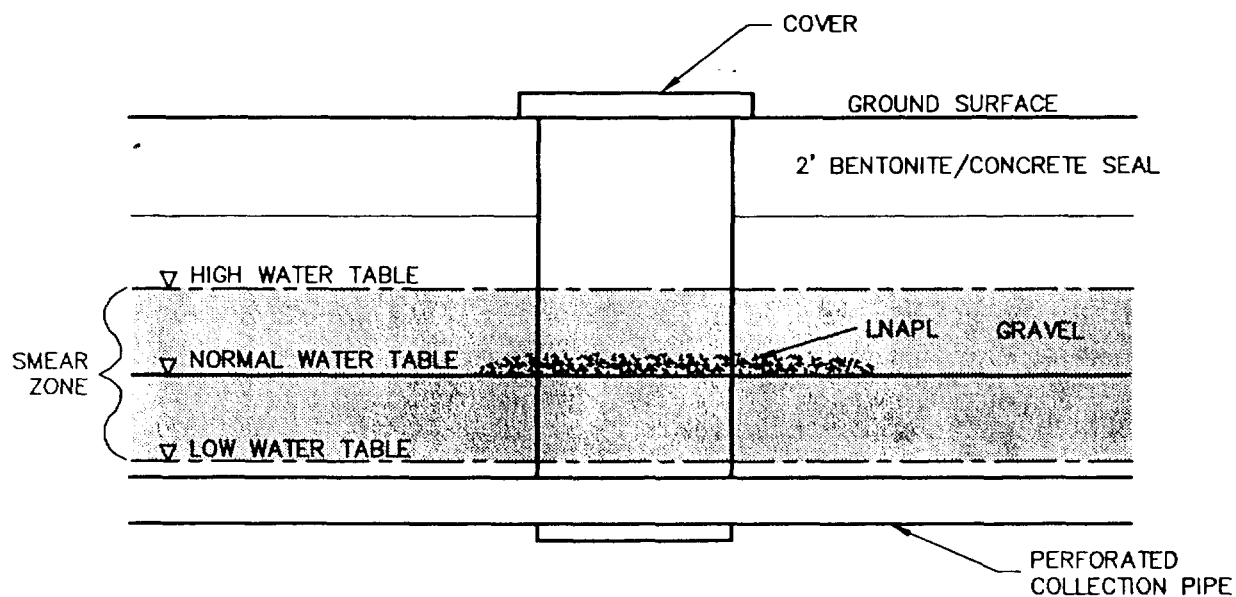
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TRENCH CROSS SECTION

NOT TO SCALE

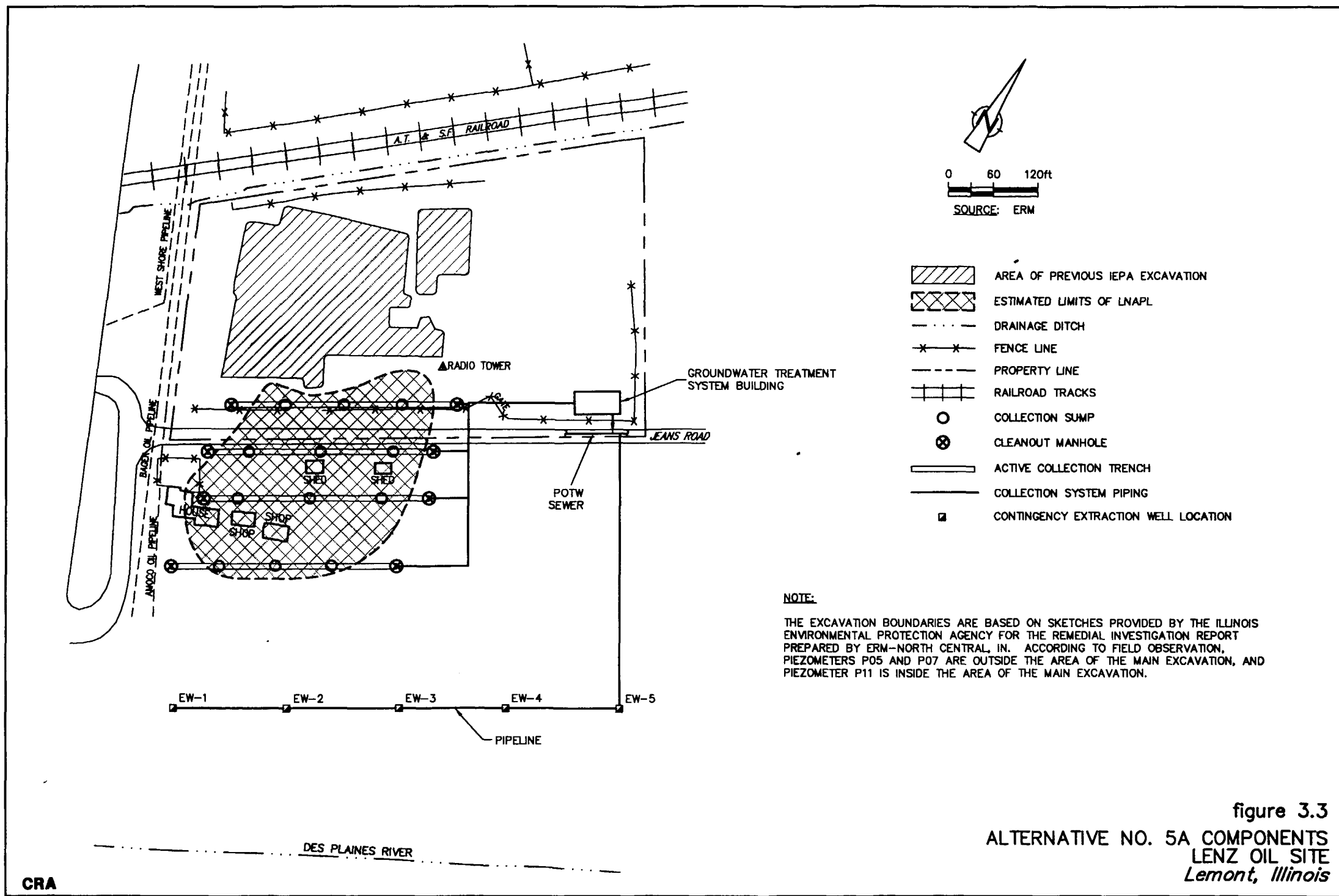


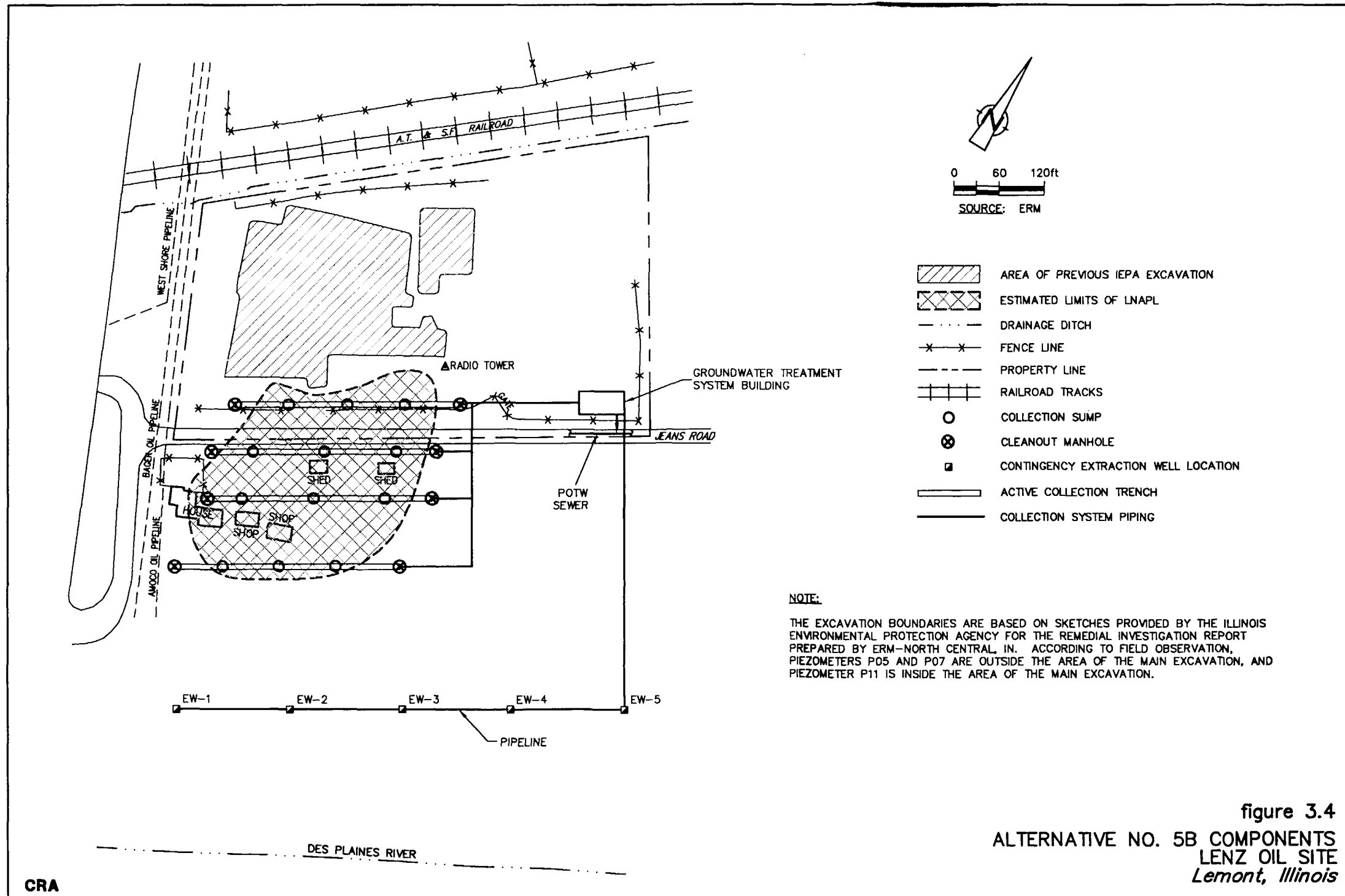
OIL COLLECTION SUMP DETAIL

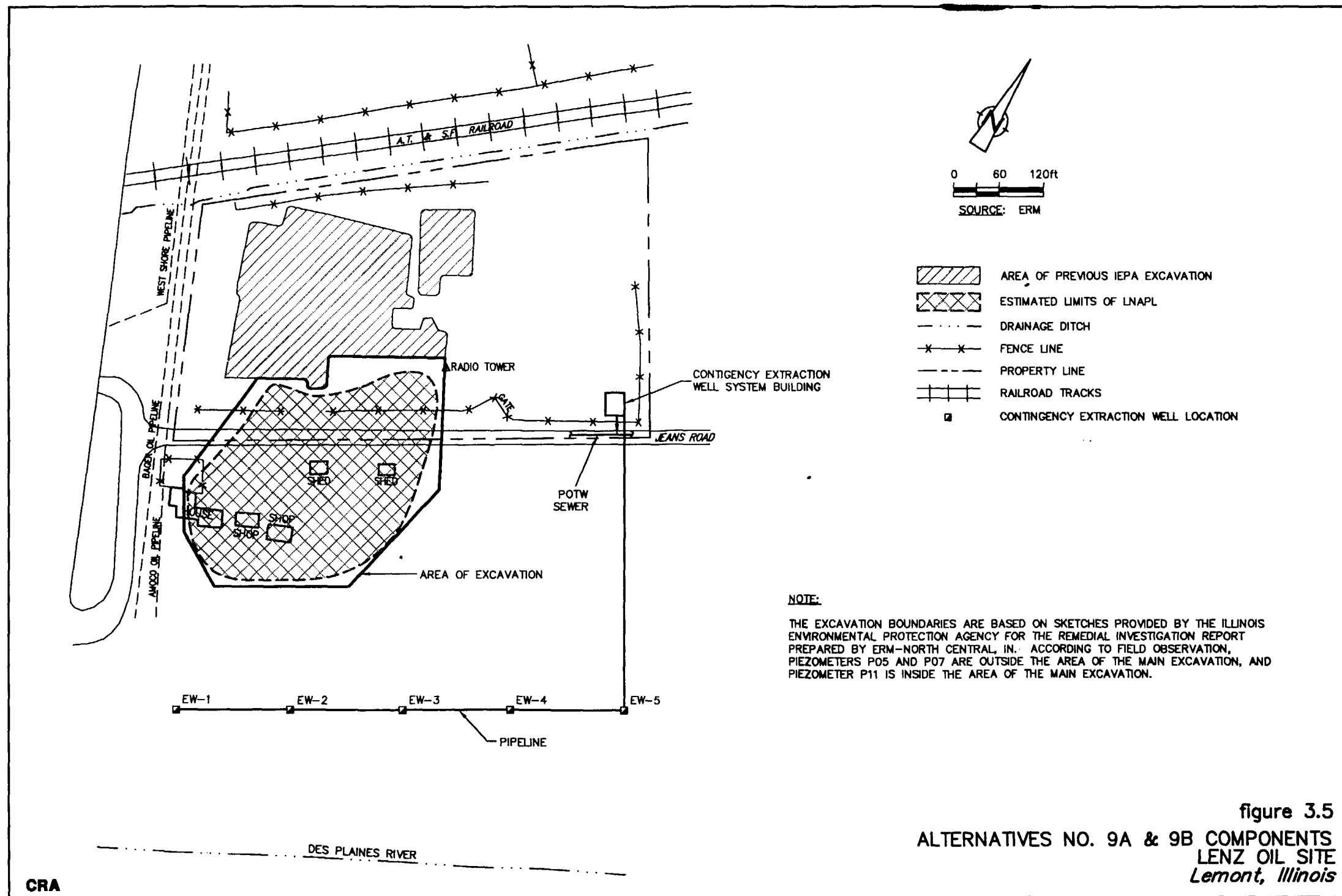
NOT TO SCALE

figure 3.2
ALTERNATIVE 2, 5A & 5B CROSS SECTION
LENZ OIL SITE
Lemont, Illinois

CRA







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**NINE CRITERIA EVALUATION
LENZ OIL SITE - LEMONT, ILLINOIS**

<i>Nine Criteria</i>	<i>Alternative 2 Passive LNAPL Collection</i>	<i>Alternative 5A Seasonal Active LNAPL Collection</i>	<i>Alternative 5B Year Round Active LNAPL Collection</i>	<i>Alternative 9A Excavation and Solidification/Stabilization (S/S)</i>	<i>Alternative 9B Excavation and Low Temperature Thermal Treatment</i>
1. Overall Protection of Human Health and the Environment	Lateral migration of LNAPL would be prevented. Deed restrictions would prevent contact with residual LNAPL. Natural attenuation would address dissolved groundwater contamination with groundwater recovery as a contingency measure.	Alternative 5A provides the same protective features as Alternative 2, but enhances LNAPL recovery through active collection. Natural attenuation would address dissolved groundwater contamination with Groundwater recovery as a contingency measure.	Alternative 5B provides the same protective features as Alternatives 2 and 5A, but attempts to improve LNAPL recovery by year round operation. A groundwater pump and discharge system adds protection of groundwater as a contingency measure.	Alternative 9A provides protection by excavating LNAPL and soil/rock from the smear zone. Post-excavation monitoring is required to ensure effective removal. Deed restrictions are required to prevent contact with stabilized soil and rock. Groundwater recovery is available as a contingency measure.	Alternative 9B provides the same protective features as Alternative 9A, but uses LTTT instead of S/S for treatment. Deed restrictions would still be required for LNAPL too deep to be excavated.
2. Compliance with ARARs	ARAR compliant. RCRA/TSCA requirements would be met for off-Site shipment of soil/rock and recovered LNAPL excavated during trench construction.	ARAR compliant. RCRA/TSCA requirements would be met for off-Site shipment of excavated soil/rock and recovered LNAPL. IEPA and local approvals required for groundwater discharge to POTW.	ARAR compliant. Same as Alternative 5A.	ARAR compliant.	ARAR compliant.
3. Long-Term Effectiveness and Permanence	Trenches prevent LNAPL migration. Natural attenuation or groundwater extraction protects groundwater. Deed restrictions and long-term monitoring address residual LNAPL.	Same as Alternative 2, but provides more LNAPL removal.	Same as Alternatives 2 and 5A, but attempts to increase LNAPL recovery by year round operation. Groundwater is protected by natural attenuation or a Groundwater recovery contingency.	Effective removal of LNAPL. Some LNAPL below the water table may be impractical to excavate due to dewatering limitations. Stabilized soil/rock would be used as backfill. Groundwater recovery is available as a contingency measure if natural attenuation is not effective.	Same as Alternative 9A, except that thermally treated soil/rock would be backfilled.
4. Reduction in Toxicity, Mobility, and Volume (TMV) through Treatment	Reduction in LNAPL through recovery and off-Site incineration. Reduction in dissolved groundwater contamination through natural attenuation or groundwater extraction. Passive LNAPL collection is expected to remove 10 percent to 20 percent of LNAPL.	Same as Alternative 2, but provides greater reduction in TMV by greater LNAPL recovery. Active LNAPL collection is expected to recover 30 percent to 50 percent of LNAPL.	Same as Alternatives 2 and 5A, but attempts to increase LNAPL recovery by year round operations. Dissolved contamination is reduced by natural attenuation or a Groundwater recovery system as a contingency measure. Active LNAPL collection is expected to recover 30 percent to 50 percent of LNAPL.	Reductions in LNAPL through removal. Stabilization process would volatilize VOCs which would be treated as an off-gas. Groundwater recovery is available as a contingency measure if natural attenuation is not effective.	Same as Alternative 9A, except that thermal treatment provides a greater reduction in TMV..
5. Short-Term Effectiveness	Construction of trenches would be disruptive to local residents, business and traffic along Jeans Road. Worker protection would be required during trench construction. Short-term construction with long-term operation (30 years).	Same as Alternative 2. However, operation would be 10 years for Alternative 5A versus 30 years for Alternative 5B.	Same as Alternatives 2 and 5A, except operation would be over 30 years.	Excavation would be highly disruptive to local residents, business, and traffic along Jeans Road. Williams' house would be demolished. Worker protection and safety measures required prevent off-Site migration during excavation. Short-term construction (1 year) and long-term monitoring (30 years). Long-term Groundwater recovery is available as a contingency measure.	Same as Alternative 9A.

TABLE 3.1

**NINE CRITERIA EVALUATION
LENZ OIL SITE - LEMONT, ILLINOIS**

<i>Nine Criteria</i>		<i>Alternative 2 Passive LNAPL Collection</i>	<i>Alternative 5A Seasonal Active LNAPL Collection</i>	<i>Alternative 5B Year Round Active LNAPL Collection</i>	<i>Alternative 9A Excavation and Solidification/Stabilization (S/S)</i>	<i>Alternative 9B Excavation and Low Temperature Thermal Treatment</i>
6.	Implementability	Remedy employs standard construction and dewatering procedures. Excavation into bedrock could be difficult. Natural attenuation would be demonstrated through monitoring.	Same as Alternative 2.	Same as Alternatives 2 and 5A. Groundwater pump and discharge is common technology and would replace natural attenuation as a contingency measure.	Excavation and dewatering is a commonly employed construction technique. Excavation of bedrock is feasible if bedrock is weathered and difficult if bedrock is competent. Dewatering may prove impractical in fractured bedrock if fractures allow large inflow to excavation.	Same as Alternative 9A.
7.	Cost:					
	Base Cost	\$4.6 M	\$8.7 M	\$14.3 M	\$11.0 M	\$17.1 M
	Groundwater Contingency	<u>\$1.3 M</u>	<u>\$1.3 M</u>	<u>\$1.0 M</u>	<u>\$1.3 M</u>	<u>\$1.3 M</u>
	Total	\$5.9 M	\$10.0 M	\$15.3 M	\$12.3 M	\$18.4 M
8.	Community Acceptance	To be determined	To be determined	To be determined	To be determined	To be determined
9.	IEPA Acceptance	To be determined	To be determined	To be determined	To be determined	To be determined

TABLE 3.2

**ALTERNATIVE 2
PASSIVE LNAPL COLLECTION
LENZ OIL SITE - LEMONT, ILLINOIS**

- Description:**
- Deed/ Access Restrictions
 - Excavate Soil from Four Passive Trenches
 - 4 Passive Trenches
 - Natural Attenuation with Contingency Recovery and Discharge to POTW

Remedial Component	Original FS Cost Estimate (FS Table 3-5)	FS Addendum Cost Estimate	
Common Activities (Deed/ Access Restrictions and Monitoring)	\$2.4 M	\$2.0 M	(Table A.1)
Predesign Investigation ⁽¹⁾	—	\$0.4 M	(Table A.2)
LNAPL Recovery - 4 passive trenches Capital and 30 Year O&M Costs ⁽²⁾	\$2.1 M	\$2.2 M	(Table A.3)
TOTAL	\$4.5 M	\$4.6 M	
Contingency Groundwater Extraction Capital and 30 Year O&M Costs (5 wells at 15 gpm total pumping rate)	—	\$1.3 M	(Table A.10)
TOTAL WITH CONTINGENCY		\$5.9 M	

Notes:

⁽¹⁾ Included in capital costs for original FS cost estimate

⁽²⁾ Present worth based on 5 percent discount rate

TABLE 3.3

**ALTERNATIVE 5A
ACTIVE LNAPL COLLECTION
LENZ OIL SITE - LEMONT, ILLINOIS**

- Description:**
- Deed/ Access Restrictions
 - Excavate Soil from Four Active Trenches
 - Seasonal LNAPL Recovery from Four Active Trenches
 - Seasonal Groundwater Treatment (design capacity of 50 gpm)
 - Natural Attenuation with Contingency Recovery and Discharge to POTW

Remedial Component	Original FS Cost Estimate (FS Table 3-5)	FS Addendum Cost Estimate	
Common Activities (Deed/ Access Restrictions and Monitoring)	\$2.4 M	\$2.0 M	(Table A.1)
Predesign Investigations ⁽¹⁾	—	\$ 0.8 M	(Table A.2)
LNAPL Recovery (4 Active Trenches pumping a total of 26 gpm/ 2 months per year) Capital and 10 Year O&M Costs ⁽¹⁾	\$2.7 M	\$2.7 M	(Table A.5)
Groundwater Treatment System Capital and 10 Year O&M Costs ⁽²⁾	\$6.0 M	\$3.2 M	(Table A.6)
TOTAL	\$11.1 M	\$8.7 M	
Contingency Groundwater Extraction Capital and 30 Year O&M Costs (5 wells at 15 gpm total pumping rate)	\$3.0 M	\$1.3 M	(Table A.10)
TOTAL WITH CONTINGENCY	\$14.1 M	\$10.0 M	

Notes:

⁽¹⁾ Included in capital costs for original FS cost estimate

⁽²⁾ Present worth based on 5 percent discount rate

TABLE 3.4

**ALTERNATIVE 5B
ACTIVE LNAPL COLLECTION
LENZ OIL SITE - LEMONT, ILLINOIS**

- Description:**
- Deed/ Access Restrictions
 - Excavate Soil from Four Active Trenches
 - LNAPL Recovery from Four Active Trenches
 - Groundwater Treatment (design capacity of 50 gpm)
 - Contingency Groundwater Recovery - Five Wells

<i>Remedial Component</i>	<i>Original FS Cost Estimate (FS Table 3-5)</i>	<i>FS Addendum Cost Estimate</i>	
Common Activities (Deed/ Access Restrictions and Monitoring)	\$2.4 M	\$2.0 M	(Table A.1)
Predesign Investigation ⁽¹⁾	--	\$0.9 M	(Table A.2)
LNAPL Recovery (Active Trenches pumping at 26 gpm total/12 months per year) Capital and 30 Year O&M Costs ⁽²⁾	\$2.7 M	\$3.1 M	(Table A.5)
Groundwater Treatment System Capital and 30 Year O&M Costs ⁽²⁾	<u>\$6.0 M</u>	<u>\$8.3 M</u>	(Table A.8)
TOTAL	\$11.1 M	\$14.3 M	
Contingency Groundwater Extraction Capital and 30 Year O&M Costs ⁽²⁾ (5 wells at 9 gpm total pumping rate)	<u>\$3.0 M</u>	<u>\$1.0 M</u>	(Table A.7)
TOTAL WITH CONTINGENCY	\$14.1 M	\$15.3 M	

Notes:⁽¹⁾ Included in capital costs for original FS cost estimate⁽²⁾ Present worth based on 5 percent discount rate

TABLE 3.5

**ALTERNATIVE 9A
EXCAVATION AND TREATMENT - SOLIDIFICATION/STABILIZATION
LENZ OIL SITE - LEMONT, ILLINOIS**

- Description:**
- Deed Restrictions
 - Excavate Smear Zone (12,500 CY)
 - LNAPL Recovery from Open Excavation
 - Treatment of Soil and Rock by Solidification/Stabilization (S/S)
 - Natural Attenuation with Contingency Groundwater Recovery and Discharge to POTW

Remedial Component	Original FS Cost Estimate (FS Table 3-5)	FS Addendum Cost Estimate	
Common Activities (Deed Restrictions and Monitoring)	\$2.4 M	\$2.0 M	(Table A.1)
Predesign Investigations ⁽¹⁾	—	\$0.5 M	(Table A.2)
LNAPL Soil Excavation, Backfill, and Remediation by Ex-Situ S/S, Capital and 30 Year O&M Costs ⁽²⁾	<u>\$5.2 M</u>	<u>\$8.5 M</u>	(Table A.11)
TOTAL	\$7.6 M	\$11.0 M	
Contingency Groundwater Recovery and Discharge to POTW Capital and 30 Year O&M Costs ⁽²⁾ (5 wells at 15 gpm total pumping rate)	—	\$1.3 M	(Table A.10)
TOTAL WITH CONTINGENCY		\$12.3 M	

Notes:

⁽¹⁾ Included in capital costs for original FS cost estimate

⁽²⁾ Present worth based on 5 percent discount rate

TABLE 3.6

ALTERNATIVE 9B
EXCAVATION AND TREATMENT - LOW TEMPERATURE THERMAL TREATMENT (LTTT)
LENZ OIL SITE - LEMONT, ILLINOIS

- Description:**
- Deed Restrictions
 - Excavate Smear Zone (12,500 CY)
 - LNAPL Collection from Open Excavation
 - Treatment of Soil and Rock by LTTT
 - Natural Attenuation with Contingency Groundwater Recovery and Discharge to POTW

Remedial Component	Original FS Cost Estimate (FS Table 3-5)	FS Addendum Cost Estimate	
Common Activities (Deed/ Restrictions and Monitoring)	\$2.4 M	\$2.0 M	(Table A.1)
Predesign Investigations ⁽¹⁾	—	\$0.6 M	(Table A.2)
LNAPL Soil Excavation, Backfill, and Remediation by LTTT Capital and 30 Year O&M Costs ⁽²⁾	<u>\$8.1 M</u>	<u>\$14.5 M</u>	(Table A.12)
TOTAL	\$10.5 M	\$17.1 M	
Contingency Groundwater Recovery and Discharge to POTW Capital and 30 Year O&M Costs ⁽²⁾ (5 wells at 15 gpm total pumping rate)	—	<u>\$1.3 M</u>	(Table A.10)
TOTAL WITH CONTINGENCY		\$18.4 M	

Notes:

⁽¹⁾ Included in capital costs for original FS cost estimate

⁽²⁾ Present worth based on 5 percent discount rate

APPENDIX A

BREAKDOWN OF COSTS

TABLE A.1

COMMON ACTIVITIES
LENZ OIL SITE - LEMONT, ILLINOIS

Item	Units	Calculated Quantity	Design Quantity	Unit Price	Total Price	Calculated Quantity	Disposal Remarks	Unit Price Source
<u>Capital Cost Estimate</u>								
Institutional Controls								
Deed Restrictions	LS	1	1	\$ 10,000	\$ 10,000			
Upgrade Groundwater Monitoring Network (included in predesign groundwater and LNAPL sampling below)	LS	0	0	\$ -	\$ -			
Permitting and Legal Fees	LS	1	1	\$ 10,000	\$ 10,000			
Subtotal					\$ 20,000			
Contingency	%	30			\$ 6,000			
TOTAL CAPITAL COSTS					\$ 26,000			
<u>Operation and Maintenance (O&M) Cost Estimate</u>								
Groundwater Monitoring - twice a year								
Sample Collection/Expenses	HR		180	\$75	\$ 13,500			
Analytical	EA		40	\$1,800	\$ 72,000			
Data Review and Report	EA		2	\$8,000	\$ 16,000			
Subtotal					\$ 101,500			
Contingency	%	30			\$30,450			
TOTAL O&M COSTS					\$ 131,950 /per year			
30 Year Present Worth	%	5			\$2,028,335			
TOTAL CAPITAL AND O&M COSTS					\$ 2,054,335			

TABLE A.2

PREDESIGN INVESTIGATION COST ESTIMATES
LENZ OIL SITE - LEMONT, ILLINOIS

Activity	Unit	Number of Units	Unit Cost	Total Cost	Comments
<u>Predesign Groundwater and LNAPL Sampling - Alternatives 2, 5A, 5B, 9A, and 9B</u>					
Plan preparation/Mobilization	LS	1	\$ 21,000	\$ 21,000	Work plan, sampling plan, QAPP, H&S
Shallow well installation	WELL	3	\$ 5,000	\$ 15,000	
Deep well installation	WELL	4	\$ 8,000	\$ 32,000	
Well and piezometer abandonment	EACH	9	\$ 3,000	\$ 27,000	
Health and safety	LS	1	\$ 7,000	\$ 7,000	
Water disposal (includes trucking)	GAL	5,000	\$ 0.73	\$ 3,650	
Well cuttings disposal (includes trucking)	CY	100	\$ 292	\$ 29,200	RCRA Subtitle C Landfill (soil) at Detroit, MI
Well development	WELL	6	\$ 750	\$ 4,500	
LNAPL disposal	GAL	200	\$ 4.75	\$ 950	TSCA and RCRA incinerator (liquid) at Deer Park, TX
Well purging and collection of samples	DAY	5	\$ 4,000	\$ 20,000	6 new and 10 existing wells; incl: labor and expenses
Water laboratory analyses					Includes 30% QA/QC samples
VOCs	SAMPLE	21	\$ 200	\$ 4,200	
SVOCs	SAMPLE	21	\$ 350	\$ 7,350	
PCB	SAMPLE	21	\$ 200	\$ 4,200	
Total inorganics	SAMPLE	21	\$ 180	\$ 3,780	
LNAPL laboratory analyses					Includes 30% QA/QC samples
VOCs	SAMPLE	21	\$ 160	\$ 3,360	
SVOCs	SAMPLE	21	\$ 245	\$ 5,145	
PCB	SAMPLE	21	\$ 175	\$ 3,675	
Total inorganics	SAMPLE	21	\$ 150	\$ 3,150	
Data evaluation and report preparation	LS	1	\$ 20,000	\$ 20,000	
Subtotal				\$ 215,160	
<u>Vacuum Enhanced Recovery Pilot Study - Alternatives 5A and 5B</u>					
Develop work plan	LS	1	\$ 8,000	\$ 8,000	
Set four wells	LS	1	\$ 5,000	\$ 5,000	
Rent test rig, transport, P-V-F	LS	1	\$ 6,000	\$ 6,000	
Oil and water storage and disposal	LS	1	\$ 8,800	\$ 8,800	
Laboratory analyses	LS	1	\$ 10,000	\$ 10,000	
Labor	LS	1	\$ 13,200	\$ 13,200	
Oversight, data evaluation and summary report	LS	1	\$ 27,000	\$ 27,000	
Subtotal				\$ 78,000	

TABLE A.2

PREDESIGN INVESTIGATION COST ESTIMATES
LENZ OIL SITE - LEMONT, ILLINOIS

<i>Activity</i>	<i>Unit</i>	<i>Number of Units</i>	<i>Unit Cost</i>	<i>Total Cost</i>	<i>Comments</i>
<u>Groundwater Treatability Tests - Alternatives 5A and 5B</u>					
Plan preparation	LS	1	\$ 30,000	\$ 30,000	Work plan, sampling plan, QAPP, H&S
Well purging and collection of samples	LS	1	\$ 10,000	\$ 10,000	
Bench scale treatability tests	LS	1	\$ 50,000	\$ 50,000	Includes labor and materials
Analyses					
VOCs	SAMPLE	42	\$ 160	\$ 6,720	
SVOCs	SAMPLE	42	\$ 245	\$ 10,290	
PNAs	SAMPLE	42	\$ 150	\$ 6,300	
PCBs	SAMPLE	42	\$ 175	\$ 7,350	
Inorganics	SAMPLE	42	\$ 150	\$ 6,300	
General chemistry	SAMPLE	168	\$ 100	\$ 16,800	
Data evaluation and report preparation	LS	1	\$ 20,000	\$ 20,000	To be submitted with the 30% design report
Subtotal				\$ 163,760	
<u>Predesign Soil Sampling - Alternatives 2, 5A, and 5B</u>					
Plan preparation/Mobilization	LS	1	\$ 16,000	\$ 16,000	Work plan, sampling plan, QAPP, H&S
Sample collection	DAY	5	\$ 2,000	\$ 10,000	5 days of sampling; includes labor and expenses
Analyses					
VOCs - laboratory	SAMPLE	60	\$ 200	\$ 12,000	
PCBs - laboratory	SAMPLE	60	\$ 150	\$ 9,000	
Data evaluation and report preparation	LS	1	\$ 20,000	\$ 20,000	To be submitted with the 30% design report
Subtotal				\$ 67,000	
<u>Predesign Soil Sampling - Alternatives 9A and 9B</u>					
Plan preparation/Mobilization	LS	1	\$ 16,000	\$ 16,000	Work plan, sampling plan, QAPP, H&S
Sample collection	DAY	15	\$ 2,000	\$ 30,000	15 days of sampling; includes labor and expenses
Analyses					
VOCs - laboratory	SAMPLE	200	\$ 200	\$ 40,000	
PCBs - laboratory	SAMPLE	200	\$ 150	\$ 30,000	
Data evaluation and report preparation	LS	1	\$ 30,000	\$ 30,000	To be submitted with the 30% design report
Subtotal				\$ 146,000	

TABLE A.2

PREDESIGN INVESTIGATION COST ESTIMATES
LENZ OIL SITE - LEMONT, ILLINOIS

Activity	Unit	Number of Units	Unit Cost	Total Cost	Comments
<u>Active Recovery Trench Pilot Tests - Alternatives 5A and 5B</u>					
Plan preparation/Mobilization	LS	1	\$ 22,000	\$ 22,000	Work plan, sampling plan, QAPP, H&S
Site preparation	LS	1	\$ 5,000	\$ 5,000	Excavation of water/LNAPL extraction trench (20 ft long) and pumps
Water storage	EACH	1	\$ 50,000	\$ 50,000	
Extracted water treatment and disposal	GAL	94,000	\$ 0.73	\$ 68,620	Extraction at 20 gpm for 48 hours to achieve drawdown; 5 gpm for 5 days; Subtitle C-permitted facility disposal after LNAPL removal; includes transportation and disposal
Disposal of LNAPL	GAL	200	\$ 4.75	\$ 950	Off-site TSCA and RCRA incineration facility; includes disposal and transportation
Analyses	LS	1	\$ 5,000	\$ 5,000	
Conduct Field Test	DAY	9	\$ 5,000	\$ 45,000	Extraction of groundwater and LNAPL and collection of samples; 7 days of testing at 24 h/d; 2 days of prep.; includes labor, materials, and field expenses
Data evaluation and report preparation	LS	1	\$ 30,000	\$ 30,000	Includes modeling; to be submitted with the 30% design report
Subtotal				\$ 226,570	
<u>Aquifer Pump Test - Alternatives 2, 5B, 9A and 9B</u>					
Plan preparation/Mobilization	LS	1	\$ 16,000	\$ 16,000	Work plan, sampling plan, QAPP, H&S
Extraction well installation	WELL	1	\$ 3,000	\$ 3,000	
Piezometer installation	EACH	3	\$ 2,000	\$ 6,000	
Well development	WELL	4	\$ 750	\$ 3,000	
Test	DAY	4	\$ 5,000	\$ 20,000	Extraction of groundwater collection of samples; 2 days of testing at 24 h/d and 2 days of prep.; includes labor, materials, and field expenses
Water storage	EACH	0	\$ -	\$ -	Included in the active recovery trench pilot test
Development, decon, and extracted water disposal	GAL	57,600	\$ 0.73	\$ 42,048	Extraction at 20 gpm for 48 hours; disposal at RCRA facility at Deer Park, TX
Data evaluation and report preparation	LS	1	\$ 20,000	\$ 20,000	Includes modeling; to be submitted with 30% design report
Subtotal				\$ 110,048	

TABLE A.2

PREDESIGN INVESTIGATION COST ESTIMATES
LENZ OIL SITE - LEMONT, ILLINOIS

<i>Activity</i>	<i>Unit</i>	<i>Number of Units</i>	<i>Unit Cost</i>	<i>Total Cost</i>	<i>Comments</i>
<u><i>Solidification/Stabilization Treatability Test - Alternative 9A</i></u>					
Plan preparation/Mobilization	LS	1	\$ 25,000	\$ 25,000	Work plan, sampling plan, QAPP, H&S
Sample collection	LS	1	\$ 5,000	\$ 5,000	100 lb of soil; 2 days of sampling; includes labor and expenses
Bench scale treatability test and report	LS	1	\$ 25,000	\$ 25,000	To be submitted with the 30% design report
Subtotal				\$ 55,000	
<u><i>LTED Treatability Test - Alternative 9B</i></u>					
Plan preparation/Mobilization	LS	1	\$ 21,000	\$ 21,000	Work plan, sampling plan, QAPP, H&S
Sample collection	LS	1	\$ 5,000	\$ 5,000	100 lb of soil; 1 day of sampling; includes labor and expenses
Bench scale treatability tests	LS	1	\$ 50,000	\$ 50,000	Vendor estimate
Analyses	SAMPLE	10	\$ 500	\$ 5,000	
Data evaluation and report preparation	LS	1	\$ 8,000	\$ 8,000	To be submitted with the 30% design report
Subtotal				\$ 89,000	

TABLE A.3

**CAPITAL COST ESTIMATE - LNAPL RECOVERY
ALTERNATIVE 2 - PASSIVE FOUR TRENCHES
LENZ OIL SITE - LEMONT, ILLINOIS**

CAPITAL COST ESTIMATE

Item	Units	Calculated Quantity	Design Quantity	Unit Price	Total Price	Calculated Quantity	Remarks	Unit Price Source
Mobilization	LS	1	1	\$ 15,000	\$ 15,000			
Surveying	LS	1	1	\$ 3,000	\$ 3,000			
Clean unconsolidated soil excavation	CY	933	1,000	\$ 50	\$ 50,000	4 trenches x 300 ft long x 3 ft wide x 7 ft deep		
Stained unconsolidated soil excavation	CY	533	600	\$ 150	\$ 90,000	4 trenches x 300 ft long x 3 ft wide x 4 ft smear		
Excavation dewatering								
Dewatering points and piping	EA	16	16	\$ 2,000	\$ 32,000	Pumps and controls		
Dewatering system operation	WK	5	5	\$ 2,000	\$ 10,000	Excavation rate of 200 cy/wk		
Dewatering storage tank	EA	1	1	\$ 71,335	\$ 71,335	125,000 gallon capacity		
Water disposal (includes trucking)	GAL	252,546	252,000	\$ 0.73	\$ 183,960	5 gpm for noted duration RCRA Subtitle C Treatment		Rollins Envir., Inc. at Deer Park, TX
Absorbent Disposal	LS	1	1	\$ 25,000	\$ 25,000	TSCA Incineration (solid) - LNAPL w/absorbent		Waste Management at Port Arthur, TX
Collection gravel	CY	800	800	\$ 30	\$ 24,000	4 trenches x 300 ft long x 3 ft wide x 6 ft gravel		
Geotextile membrane	SF	3,600	4,000	\$ 0.68	\$ 2,720	Trench areas, 4 trenches x 300 ft x 3 ft		National Seal
LNAPL collection system								
Collection risers - 20 inch perforated	EA	12	12	\$ 600	\$ 7,200	3 per trench		
Trench seal	CY	267	230	\$ 25.20	\$ 5,796	Top 2 ft of trenches with bentonite/cement		Means 021-684-0100
Disposal								
Contaminated soil	CY	533	600	\$ 292	\$ 175,200	RCRA Subtitle C Landfill		Clean Harbors Envir. Serv. at Detroit, MI
Collection sumps/cleanout manholes	EA	20	20	\$ 2,000	\$ 40,000			
Compressed air piping system - 2-inch	LF	2,500	2,500	\$ 9.90	\$ 24,750	Distance to treatment system and between trenches		Means A12.3-520-3090
Pump discharge piping system - 2-inch	LF	2,500	2,500	\$ 4.41	\$ 11,025	Distance to treatment system and between trenches		Means A12.3-520-3090
Collection system								
Shop relocation	LS	1	1	\$ 33,600	\$ 33,600			Means 020-620-3000
Shed demolition	LS	3	3	\$ 2,000	\$ 6,000			
Trucking off-site and disposal	CY	20	20	\$ 59	\$ 1,180	RCRA Subtitle D Landfill		Peoria Disposal Company at Clinton, IL
Temporary relocation								
Residents	WK	7.3	8	\$ 6,300	\$ 50,400	Work duration: 3 residents, hotel with allocations for expenses at \$300/day		
Lost commercial product								
Landscaper	WK	7.3	8	\$ 5,000	\$ 40,000	Work duration: lost income Excavation rate of 200 cy/wk ⁽¹⁾		
Excavation/treatment duration	WK	7.3	8					
Air monitoring with an HNu	WK	7.3	8	\$ 2,000	\$ 16,000	Labor and materials		
H&S equipment	WK	7.3	8	\$ 2,000	\$ 16,000			

TABLE A.3

**CAPITAL COST ESTIMATE - LNAPL RECOVERY
ALTERNATIVE 2 - PASSIVE FOUR TRENCHES
LENZ OIL SITE - LEMONT, ILLINOIS**

CAPITAL COST ESTIMATE

<i>Item</i>	<i>Units</i>	<i>Calculated Quantity</i>	<i>Design Quantity</i>	<i>Unit Price</i>	<i>Total Price</i>	<i>Calculated Quantity</i>	<i>Remarks</i>	<i>Unit Price Source</i>
Decontamination materials and labor	WK	7.3	8	\$ 300	\$ 2,400			
Water disposal (includes trucking)	GAL	2,366	2,400	\$ 0.73	\$ 1,752		RCRA Subtitle C Treatment	Rollins Envir., Inc. at Deer Park, TX
Demobilization	LS	1	1	\$ 5,000	\$ 5,000			
Subtotal					\$ 943,318			
Design Engineering	%	15			\$ 141,498			
Construction Management	%	25			\$ 235,830			
Insurance	%	2.5			\$ 23,583			
Permitting and Legal Fees	LS	1	1	\$ 10,000	\$ 10,000			
Soil Analysis Before Disposal	LS	1	1	\$ 5,000	\$ 5,000			
Subtotal					\$ 1,359,228			
Contingency	%	30			\$ 407,768			
CAPITAL COST ESTIMATE TOTAL					\$ 1,766,997			
O&M COST ESTIMATE SUMMARY (see Table A.4)								
LNAPL RECOVERY- Passive 4 trenches					\$ 27,503	/year		
30 YEAR PRESENT WORTH (5%)					\$ 422,783			
GRAND TOTAL					\$ 2,189,780			

Notes:

(1) Excavation rate of 5 to 10 cubic yards per hour

Excavating 8 hours a day, 5 days a week

Minimum excavation rate 200 cy/wk (used)

Maximum excavation rate 400 cy/wk

TABLE A.4

OPERATION AND MAINTENANCE COST ESTIMATE
LENZ OIL SITE - LEMONT, ILLINOIS

Option Description	Flowrates			Filter Media Disposal (Includes new media)					
	Trenches gpm - total)	EW (gpm - total)	Surfactant (gpm - total)	Gravity Oil Filter Media ppm	Filter Media pounds	Primary Solids Filter Media ppm	Filter Media pounds	Polishing Solids Filter Media ppm	Filter Media pounds
Passive Recovery with 4 trenches	0	0	0	0	0	0	0	0	0
Groundwater Treatment Active recovery with 4 trenches	26	9	0	5	569	40	6,588	10	1,647
Groundwater Treatment Active recovery - Seasonal with 4 trenches	26	0	0	5	95	40	1,098	10	274
Contingency Groundwater Recovery (5 wells) in conjunction with 4 active trenches	0	9	0	0	0	0	0	0	0
Contingency Groundwater Recovery (5 wells)	0	15	0	0	0	0	0	0	0

Option Description	Chemical Feeds				Manpower			
	pH Adjustment ppm	pH Adjustment pounds	Emulsion Breaker ppm	Emulsion Breaker pounds	Surfactant ppm	Surfactant pounds	Operating hr/wk	Supervision hr/mo
Passive Recovery with 4 trenches	0	0	0	0	0	0	8	0
Groundwater Treatment Active recovery with 4 trenches	50	5,695	0	0	0	0	32	24
Groundwater Treatment Active recovery - Seasonal with 4 trenches	50	950	0	0	0	0	32	24
Extraction Wells	0	0	0	0	0	0	4	0

TABLE A.5

**CAPITAL COST ESTIMATE - LNAPL RECOVERY
ALTERNATIVES 5A AND 5B ACTIVE FOUR TRENCHES
LENZ OIL SITE - LEMONT, ILLINOIS**

CAPITAL COST ESTIMATE

Item	Units	Calculated Quantity	Design Quantity	Unit Price	Total Price	Calculated Quantity Remarks	Unit Price Source
Mobilization	LS	1	1	\$ 15,000	\$ 15,000		
Surveying	LS	1	1	\$ 3,000	\$ 3,000		
Clean unconsolidated soil excavation	CY	933	1,000	\$ 50	\$ 50,000	4 trenches x 300 ft long x 3 ft wide x 7 ft deep	
Stained unconsolidated soil excavation	CY	533	600	\$ 150	\$ 90,000	4 trenches x 300 ft long x 3 ft wide x 4 ft smear zone	
Excavation dewatering							
Dewatering points and piping	EA	16	16	\$ 2,000	\$ 32,000	Pumps and controls	
Dewatering system operation	WK	5	5	\$ 2,000	\$ 10,000	Excavation rate of 200 cy/wk	
Dewatering storage tank	EA	1	1	\$ 71,335	\$ 71,335	125,000 gallon capacity	
Water disposal (includes trucking)	GAL	252,546	252,000	\$ 1	\$ 183,960	5 gpm for noted duration RCRA Subtitle C Treatment	Rollins Envir., Inc. at Deer Park, TX
Absorbent Disposal	LS	1	1	\$ 25,000	\$ 25,000	TSCA Incineration (solid) - LNAPL w/absorbent	Waste Management at Port Arthur, TX
Collection gravel	CY	800	800	\$ 30	\$ 24,000	4 trenches x 300 ft long x 3 ft wide x 6 ft gravel	
Geotextile membrane	SF	3,600	4,000	\$ 1	\$ 2,720	Trench areas, 4 trenches x 300 ft x 3 ft	National Seal
LNAPL collection system							
Collection risers - 20 inch perforated	EA	12	12	\$ 600	\$ 7,200	3 per trench	
Trench seal	CY	267	230	\$ 25	\$ 5,796	Top 2 ft of trenches with bentonite/cement	Means 021-684-0100
Disposal							
Contaminated soil material	CY	533	600	\$ 292	\$ 175,200	RCRA Subtitle C Landfill (2)	Clean Harbors Envir. Serv. at Detroit, MI
Collection system							
Collection sump and cleanout manholes	EA	20	20	\$ 2,000	\$ 40,000		
Compressed air piping system - 2-inch	LF	2,500	2,500	\$ 10	\$ 24,750	Distance to treatment system and between trenches	Means A123-520-3090
Pump discharge piping system - 2-inch	LF	2,500	2,500	\$ 4	\$ 11,025	Distance to treatment system and between trenches	Means A123-520-3090
System discharge flow meters	EA	4	4	\$ 6,000	\$ 24,000		Fisher-Rosemount Magmeter
Pressure testing	LS	1	1	\$ 2,000	\$ 2,000		
Buildings, including foundation, lights & heat	EA	12	12	\$ 6,400	\$ 76,800	8 ft by 8 ft building	
Product removal pumps and piping	EA	12	12	\$ 2,000	\$ 24,000		GeoGuard
Extraction pumps with controllers	EA	12	12	\$ 6,000	\$ 72,000		GeoGuard
Oil storage drums - double wall	EA	12	12	\$ 250	\$ 3,000	55-gallon drums, one at each LNAPL collection point	
Electrical distribution system	LS	1	1	\$ 33,000	\$ 33,000		
Building cost							
Foundation	SF	288	290	\$ 2	\$ 673	area of 12 ft by 24 ft	
Building, installed	SF	288	290	\$ 130	\$ 37,700	area of 12 ft by 24 ft	Parkline Buildings
Air compressor system	EA	1	1	\$ 18,000	\$ 18,000	70 scfm - 15 hp	Quincy Compressors
Roadway Crossing	LS	1	1	\$ 15,000	\$ 15,000		
Shop relocation	LS	1	1	\$ 33,600	\$ 33,600		Means 020-620-3000
Shed demolition	LS	3	3	\$ 2,000	\$ 6,000		

TABLE A.5

**CAPITAL COST ESTIMATE - LNAPL RECOVERY
ALTERNATIVES 5A AND 5B ACTIVE FOUR TRENCHES
LENZ OIL SITE - LEMONT, ILLINOIS**

CAPITAL COST ESTIMATE

<i>Item</i>	<i>Units</i>	<i>Calculated Quantity</i>	<i>Design Quantity</i>	<i>Unit Price</i>	<i>Total Price</i>	<i>Calculated Quantity</i>	<i>Remarks</i>	<i>Unit Price Source</i>
Trucking off-site and disposal	CY	20	20	\$ 59	\$ 1,180		RCRA Subtitle D Landfill	Peoria Disposal Company at Clinton, IL
Temporary relocation Residents	WK	7.3	8	\$ 6,300	\$ 50,400		Work duration; 3 residents, hotel with allocations for expenses at \$300/day	
Lost commercial production Landscaper	WK	7.3	8	\$ 5,000	\$ 40,000		Work duration; lost income excavation rate of 200 cy/w	
Excavation/treatment duration	WK	7.3	8					
Air monitoring with an HNu	WK	7.3	8	\$ 2,000	\$ 16,000		Labor and materials	
H&S equipment	WK	7.3	8	\$ 2,000	\$ 16,000			
Decontamination materials and labor	WK	7.3	8	\$ 300	\$ 2,400			Clean Harbors Envir., Services
Decon water storage	GAL	2,366	2,400	\$ 0	\$ 240		300 gal per week	Baker Tank
Water disposal (includes trucking)	GAL	2,366	2,400	\$ 1	\$ 1,752		RCRA Subtitle C Treatment	Rollins Envir., Inc. at Deer Park, TX
Demobilization	LS	1	1	\$ 5,000	\$ 5,000			
Subtotal					\$ 1,249,731			
Design Engineering	%	15			\$ 187,460			
Construction Management	%	25			\$ 312,433			
Insurance	%	2.5			\$ 31,243			
Permitting and Legal Fees	LS	1	1	\$ 10,000	\$ 10,000			
Soil Analysis Before Disposal	LS	1	1	\$ 5,000	\$ 5,000			
Subtotal					\$ 1,795,866			
Contingency	%	30			\$ 538,760			
CAPITAL COST ESTIMATE TOTAL					\$ 2,334,626			
O&M COST ESTIMATE SUMMARY (see Table A.4)								
LNAPL RECOVERY - ACTIVE 4 TRENCHES					\$ 53,000			
10 YEAR PRESENT WORTH (5%) - ALTERNATIVE 5A					\$ 409,000			
GRAND TOTAL - ALTERNATIVE 5A					\$ 2,743,626			
CAPITAL COST ESTIMATE TOTAL					\$ 2,334,626			
O&M COST ESTIMATE SUMMARY (see Table A.4)								
LNAPL RECOVERY - ACTIVE 4 TRENCHES					\$ 49,346			
30 YEAR PRESENT WORTH (5%) - ALTERNATIVE 5B					\$ 758,540			
GRAND TOTAL - ALTERNATIVE 5B					\$ 3,093,166			

TABLE A.6

COST ESTIMATE - GROUNDWATER TREATMENT SYSTEM
ALTERNATIVE 5A - SEASONAL LNAPL RECOVERY - ACTIVE, WITH GROUNDWATER RECOVERY
DESIGN FLOW RATE OF 30 GPM
LENTZ OIL SITE - LEMONT, ILLINOIS

CAPITAL COST ESTIMATE

Item	Units	Quantity	Unit Price	Total Price	Quantity	Remarks	Unit Price Source
Building							
Prefabricated building	SF	4,000	\$ 115	\$ 460,000	50 ft wide by 80 ft long		Parkline Buildings
Building placement	SF	4,000	\$ 15	\$ 60,000	50 ft wide by 80 ft long		Parkline Buildings
Equipment support steel	LB	10,000	\$ 2.09	\$ 20,900			Means 050-230-0450
Misc. equipment, office, restroom, etc.	LS	1	\$ 10,000	\$ 10,000			
Parking lot -asphalt	SF	2,000	\$ 3.92	\$ 7,840	25 ft wide by 80 ft long		Asphalt cap cost
Utilities							
Electrical service	LS	1	\$ 20,000	\$ 20,000			
Phone service	LS	1	\$ 1,000	\$ 1,000			
Potable water service	LS	1	\$ 20,000	\$ 20,000			
Connection to sanitary sewer	LS	1	\$ 20,000	\$ 20,000			
Treatment equipment systems							
Oil-water separator	EA	1	\$ 8,568	\$ 8,568	1 operating (65 gpm capacity)		ECHOS 33-13-1212
Oil filters - gravity with disposable media	EA	1	\$ 5,712	\$ 5,712	1 operating (50 gpm capacity)		ECHOS 33-13-1212
Solids thickener/holding tank with pumps	EA	1	\$ 6,720	\$ 6,720	1,000 gal with 2 pumps (50 gpm capacity @ 1.5 hp)		ECHOS 33-10-9657/29-0121
pH adjustment	EA	1	\$ 2,576	\$ 2,576	5,500 gal with 1/3 hp mixer		ECHOS 33-10-9656/13-0416
Chemical feed system, with tank and pumps	EA	1	\$ 13,059	\$ 13,059	500 gal SS with two 20 gph pumps		ECHOS 33-32-0118/0121
Pumping station, with tank and pumps	EA	1	\$ 6,720	\$ 6,720	1,000 gal with 2 pumps (50 gpm capacity @1.5 hp)		ECHOS 33-10-9657/29-0121
Air stripper, with blower	EA	1	\$ 23,318	\$ 23,318	Package unit (50 gpm capacity @ 1.5 hp)		ECHOS 33-13-0714/074/0752
Pumping station, with tank and pumps	EA	1	\$ 6,720	\$ 6,720	1,000 gal with 2 pumps (50 gpm capacity @1.5 hp)		ECHOS 33-10-9657/29-0121
Solids filters - pressure with disposable media	EA	1	\$ 9,957	\$ 9,957	1 operating (65 gpm capacity)		ECHOS 33-13-0102
Solids filters - pressure with disposal media	EA	1	\$ 9,957	\$ 9,957	1 operating (65 gpm capacity)		ECHOS 33-13-0102
Utility air compressor unit	EA	1	\$ 7,280	\$ 7,280	13 scfm @ 200 psi - 6 hp motor		ECHOS 33-13-0201
Piping systems							
Process water (2 inch CPVC)	LF	1,000	\$ 44.22	\$ 44,220			Means151-551-5910,
Process air (4 inch CPVC)	LF	500	\$ 54.60	\$ 27,300			Means151-551-5940,
Compressed air (1 inch steel)	LF	200	\$ 47.88	\$ 9,576			Means151-701-5580,
Potable water (1-1/2 inch steel)	LF	200	\$ 26.71	\$ 5,342			Means151-701-5570,
Instrumentation systems							
Control panel	LS	1	\$ 75,000	\$ 75,000			
Level control	EA	4	\$ 5,000	\$ 20,000			
Flow control	EA	4	\$ 5,000	\$ 20,000			
Pressure control	EA	3	\$ 5,000	\$ 15,000			
pH control	EA	1	\$ 5,000	\$ 5,000			
Communication	LS	1	\$ 1,000	\$ 1,000			
Computer	LS	1	\$ 5,000	\$ 5,000			
Subtotal				\$ 947,765			
Electrical systems (percent of above costs)							
Grounding	%	1%		\$ -			
480 volt distribution	%	7.5%		\$ -			
480/120 volt transformer	%	2%		\$ -			
12 volt distribution	%	5%		\$ -			
Instrumentation distribution	%	5%		\$ -			
Mobilization	LS	1	\$ 10,000	\$ 10,000			
Site preparation							
Area leveling	SY	667	\$ 1.97	\$ 1,314	75 ft wide by 80 ft long		Means 025-122-1050
Membrane	SF	6,000	\$ 0.50	\$ 3,000	75 ft wide by 80 ft long		

TABLE A.6

COST ESTIMATE - GROUNDWATER TREATMENT SYSTEM
ALTERNATIVE 5A - SEASONAL LNAPL RECOVERY - ACTIVE, WITH GROUNDWATER RECOVERY
DESIGN FLOW RATE OF 30 GPM
LENTZ OIL SITE - LEMONT, ILLINOIS

CAPITAL COST ESTIMATE

<i>Item</i>	<i>Units</i>	<i>Quantity</i>	<i>Unit Price</i>	<i>Total Price</i>	<i>Quantity Remarks</i>	<i>Unit Price Source</i>
Gravel	CY	148	\$ 7	\$ 1,036	50 ft wide by 80 ft long by 1 ft depth	Dee-N-Dee Trucking
Gravel placement	CY	148	\$ 3.10	\$ 459	50 ft wide by 80 ft long by 1 ft depth	Means 022-246-1050
Gravel compaction	CY	148	\$ 0.35	\$ 52	50 ft wide by 80 ft long by 1 ft depth	Means 022-226-5000
Gravel leveling	CY	444	\$ 1.97	\$ 875	75 ft wide by 80 ft long	Means 025-122-1050
Concrete work						
Welded wire fabric	MSF	400	\$ 56	\$ 22,400	6 inch by 6 inch size	Means 025-120-0600
Slab on grade with joints	SF	4,000	\$ 2.54	\$ 10,160	75 ft wide by 80 ft long	Means 026-120-0100
Air monitoring with an HNu	WK	1	\$ 2,000	\$ 2,000	Labor and materials	
H&S equipment	WK	1	\$ 2,000	\$ 2,000		
Decontamination materials and labor	LS	1	\$ 2,000	\$ 2,000		
Decon water storage	GAL	2,000	\$ 0.10	\$ 200		
Decon waste disposal (includes trucking)	GAL	2,000	\$ 0.73	\$ 1,460	RCRA Subtitle C Treatment	Baker Tank
Demobilization	LS	1	\$ 5,000	\$ 5,000		Rollins Envir., Inc. @ Deer Park, TX
Subtotal				\$ 1,009,720		
Design Engineering	%	15%		\$ 151,458		
Construction Management	%	25%		\$ 252,430		
Insurance	%	2.5%		\$ 25,243		
Permitting and Legal Fees	LS	1	\$ 5,000	\$ 5,000		
Subtotal				\$ 1,443,851		
Contingency	%	30%		\$ 433,155		
CAPITAL COST ESTIMATE TOTAL				\$ 1,877,007		
O&M COST ESTIMATE SUMMARY (see Table A.4)						
GROUNDWATER TREATMENT SYSTEM				\$ 169,278		
10 YEAR PRESENT WORTH (5%)				\$ 1,307,162		
GRAND TOTAL				\$ 3,184,169		

TABLE A.7

**COST ESTIMATE - GROUNDWATER RECOVERY (FIVE WELLS)
ALTERNATIVE 5B - CONTINGENCY
LENZ OIL SITE - LEMONT, ILLINOIS**

CAPITAL COST ESTIMATE

Item	Units	Calculated Quantity	Design Quantity	Unit Price	Total Price	Calculated Quantity	Remarks	Unit Price Source
Mobilization	LS	1	1	\$ 10,000	\$ 10,000			
Surveying	LS	1	1	\$ 2,000	\$ 2,000			
Piping trench	CY	356	360	\$ 16.33	\$ 5,879	1,200 ft long by 2 ft wide by 4 ft depth		Means 022-254-0500, ERM adjusted
Piping manholes	CY	11	20	\$ 13.04	\$ 261	5 manholes - 4 ft dia by 5 ft depth		Means 022-238-0500/0020/4250
Total Excavated	CY	367	380					
Extraction wells - 6 inch diameter by 20 ft deep	EA	5	5	\$ 7,000	\$ 35,000			
Extraction well cuttings, transportation, disposal	CY	4	4	\$ 59.40	\$ 238			
Sand bedding for piping	CY	89	90	\$ 12.56	\$ 1,130	1,200 ft by 2 ft wide by 1 ft depth		Dee-N-Dee Trucking
Backfilling Excavations								
Placement, compaction	CY	278	290	\$ 3.50	\$ 1,015	Total excavated less sand		Means 022-246-1050
Grading	SY	267	300	\$ 1.97	\$ 591	1,200 ft long by 2 ft wide		Means 025-122-1050
Excess excavated soil placement	CY	89	90	\$ 8.70	\$ 783	Total excavated less backfill		Means 022-216-4000 and 022-266-1150
Clean soil placed on-site								
Extraction well pumping system								
Pump vault	EA	5	5	\$ 5,000	\$ 25,000			Midwest Tile and Concrete
Piping manholes	EA	4	4	\$ 2,000	\$ 8,000			
Compressed air piping system - 2 inch	LF	1,440	1,500	\$ 9.90	\$ 14,850			Means A12.3-520-2090
Extraction pumps with controllers	EA	5	5	\$ 6,000	\$ 30,000			GeoGuard
Pump discharge piping system - 2 inch	LF	2,400	2,500	\$ 4.41	\$ 11,025			Means A12.3-520-2090
System discharge flow meters	EA	5	5	\$ 6,000	\$ 30,000			Fisher-Rosemount Magmeter
Pressure testing	LS	1	1	\$ 2,000	\$ 2,000			
Building cost								
Foundation	SF	288	290	\$ 2.32	\$ 673	Area of 12 ft by 24 ft		
Building, installed	SF	288	290	\$ 130	\$ 37,700	Area of 12 ft by 24 ft		Parkline Building
Air compressor system	EA	1	1	\$ 18,000	\$ 18,000	70 acfm - 15 hp		Quincy Compressors
Roadway crossing	LS	1	1	\$ 15,000	\$ 15,000			
Air monitoring with an HNu	WK	3	4	\$ 2,000	\$ 8,000			
Hand equipment	WK	3	4	\$ 2,000	\$ 8,000			
Decontamination materials and labor	WK	3	4	\$ 300	\$ 1,200			ERM estimate
Decon and well development water storage	GAL	2,100	2,400	\$ 0.10	\$ 240	300 gal per week plus 200 gal per week		Baker Tank
Water disposal (includes trucking)	GAL	2,100	2,400	\$ 0.73	\$ 1,752	RCRA Subtitle C Treatment		Rollins Envir., Inc. @ Deer Park, TX
Demobilization	LS	1	1	\$ 5,000	\$ 5,000			
Subtotal					\$ 273,336			
Design Engineering	%	15.00%			\$ 41,000			
Construction Management	%	25.00%			\$ 68,334			
Insurance	%	2.50%			\$ 6,833			
Permitting and Legal Fees	LS	1	1	\$ 10,000	\$ 10,000			
Subtotal					\$ 399,504			
Contingency	%	30.00%			\$ 119,851			
CAPITAL COST ESTIMATE TOTAL					\$ 519,356			
O&M COST ESTIMATE SUMMARY (see Table A.4)								
GROUNDWATER RECOVERY- 5 extraction wells					\$ 31,199			
30 YEAR PRESENT WORTH (5%)					\$ 479,592			
GRAND TOTAL					\$ 990,948			

TABLE A.8

COST ESTIMATE - GROUNDWATER TREATMENT SYSTEM
ALTERNATIVE 5B - LNAPL RECOVERY - ACTIVE, WITH GROUNDWATER RECOVERY
DESIGN FLOW RATE OF 50 GPM
LENTZ OIL SITE - LEMONT, ILLINOIS

CAPITAL COST ESTIMATE

<i>Item</i>	<i>Units</i>	<i>Quantity</i>	<i>Unit Price</i>	<i>Total Price</i>	<i>Quantity Remarks</i>	<i>Unit Price Source</i>
Building						
Prefabricated building	SF	4,000	\$ 115	\$ 460,000	50 ft wide by 80 ft long	Parkline Buildings
Building placement	SF	4,000	\$ 15	\$ 60,000	50 ft wide by 80 ft long	Parkline Buildings
Equipment support steel	LB	10,000	\$ 2.09	\$ 20,900		Means 050-230-0450
Misc. equipment, office, restroom, etc.	LS	1	\$ 10,000	\$ 10,000		Means 050-230-0450
Parking lot -asphalt	SF	2,000	\$ 3.92	\$ 7,840	25 ft wide by 80 ft long	Asphalt cap cost
Utilities						
Electrical service	LS	1	\$ 20,000	\$ 20,000		
Phone service	LS	1	\$ 1,000	\$ 1,000		
Potable water service	LS	1	\$ 20,000	\$ 20,000		
Connection to sanitary sewer	LS	1	\$ 20,000	\$ 20,000		
Treatment equipment systems						
Oil-water separator	EA	2	\$ 8,568	\$ 17,136	1 operating and 1 standby (65 gpm capacity)	ECHOS 33-13-1212
Oil filters - gravity with disposable media	EA	2	\$ 5,712	\$ 11,424	1 operating and 1 standby (50 gpm capacity)	ECHOS 33-13-1212
Solids separator	EA	2	\$ 8,568	\$ 17,136	1 operating and 1 standby (50 gpm capacity)	ECHOS 33-10-9657/29-0121
Solids thickener/holding tank with pumps	EA	2	\$ 6,720	\$ 13,440	1,000 gal with 2 pumps (50 gpm capacity @ 1.5	ECHOS 33-10-9657/29-0121
pH adjustment	EA	1	\$ 2,576	\$ 2,576	5,500 gal with 1/3 hp mixer	ECHOS 33-10-9656/13-0416
Chemical feed system, with tank and pumps	EA	1	\$ 13,059	\$ 13,059	500 gal SS with two 20 gph pumps	ECHOS 33-32-0118/0121
Pumping station, with tank and pumps	EA	2	\$ 6,720	\$ 13,440	1,000 gal with 2 pumps (50 gpm capacity @1.5	ECHOS 33-10-9657/29-0121
Air stripper, with blower	EA	2	\$ 23,318	\$ 46,636	Package unit (50 gpm capacity @ 1.5 hp)	ECHOS 33-13-0714/074/0752
Pumping station, with tank and pumps	EA	2	\$ 6,720	\$ 13,440	1,000 gal with 2 pumps (50 gpm capacity @1.5	ECHOS 33-10-9657/29-0121
Solids filters - pressure with disposable media	EA	2	\$ 9,957	\$ 19,914	1 operating and 1 standby (65 gpm capacity)	ECHOS 33-13-0102
Solids filters - pressure with disposal media	EA	2	\$ 9,957	\$ 19,914	1 operating and 1 standby (65 gpm capacity)	ECHOS 33-13-0102
Utility air compressor unit	EA	1	\$ 7,280	\$ 7,280	13 scfm @ 200 psi - 6 hp motor	ECHOS 33-13-0201
Piping systems						
Process water (2 inch CPVC)	LF	1,000	\$ 44.22	\$ 44,220		Means151-551-5910, ERM adjusted
Process air (4 inch CPVC)	LF	500	\$ 54.60	\$ 27,300		Means151-551-5940, ERM adjusted
Compressed air (1 inch steel)	LF	200	\$ 47.88	\$ 9,576		Means151-701-5580, ERM adjusted
Potable water (1-1/2 inch steel)	LF	200	\$ 26.71	\$ 5,342		Means151-701-5570, ERM adjusted
Instrumentation systems						
Control panel	LS	1	\$ 75,000	\$ 75,000		
Level control	EA	4	\$ 5,000	\$ 20,000		
Flow control	EA	4	\$ 5,000	\$ 20,000		
Pressure control	EA	3	\$ 5,000	\$ 15,000		
pH control	EA	1	\$ 5,000	\$ 5,000		
Communication	LS	1	\$ 1,000	\$ 1,000		
Computer	LS	1	\$ 5,000	\$ 5,000		
Subtotal				\$ 1,042,573		

TABLE A.8

COST ESTIMATE - GROUNDWATER TREATMENT SYSTEM
ALTERNATIVE 5B - LNAPL RECOVERY - ACTIVE, WITH GROUNDWATER RECOVERY
DESIGN FLOW RATE OF 50 GPM
LENTZ OIL SITE - LEMONT, ILLINOIS

CAPITAL COST ESTIMATE

<i>Item</i>	<i>Units</i>	<i>Quantity</i>	<i>Unit Price</i>	<i>Total Price</i>	<i>Quantity Remarks</i>	<i>Unit Price Source</i>
Electrical systems (percent of above costs)						
Grounding	%	1%		\$ 10,426		
480 volt distribution	%	7.5%		\$ 78,193		
480/120 volt transformer	%	2%		\$ 20,851		
12 volt distribution	%	5%		\$ 52,129		
Instrumentation distribution	%	5%		\$ 52,129		
Mobilization	LS	1	\$ 10,000	\$ 10,000		
Site preparation						
Area leveling	SY	667	\$ 1.97	\$ 1,314	75 ft wide by 80 ft long	Means 025-122-1050
Membrane	SF	6,000	\$ 0.50	\$ 3,000	75 ft wide by 80 ft long	
Gravel	CY	148	\$ 7	\$ 1,036	50 ft wide by 80 ft long by 1 ft depth	Dee-N-Dee Trucking
Gravel placement	CY	148	\$ 3.10	\$ 459	50 ft wide by 80 ft long by 1 ft depth	Means 022-246-1050
Gravel compaction	CY	148	\$ 0.35	\$ 52	50 ft wide by 80 ft long by 1 ft depth	Means 022-226-5000
Gravel leveling	CY	444	\$ 1.97	\$ 875	75 ft wide by 80 ft long	Means 025-122-1050
Concrete work						
Welded wire fabric	MSF	400	\$ 56	\$ 22,400	6 inch by 6 inch size	Means 025-120-0600
Slab on grade with joints	SF	4,000	\$ 2.54	\$ 10,160	75 ft wide by 80 ft long	Means 026-120-0100
Air monitoring with an HNu	WK	1	\$ 2,000	\$ 2,000	Labor and materials	
H&S equipment	WK	1	\$ 2,000	\$ 2,000		
Decontamination materials and labor	LS	1	\$ 2,000	\$ 2,000		
Decon water storage	GAL	2,000	\$ 0.10	\$ 200		Baker Tank
Decon waste disposal (includes trucking)	GAL	2,000	\$ 0.73	\$ 1,460	RCRA Subtitle C Treatment	Rollins Envir., Inc. @ Deer Park, TX
Demobilization	LS	1	\$ 5,000	\$ 5,000		
Subtotal				\$ 1,318,256		
Design Engineering	%	15%		\$ 197,738		
Construction Management	%	25%		\$ 329,564		
Insurance	%	2.5%		\$ 32,956		
Permitting and Legal Fees	LS	1	\$ 5,000	\$ 5,000		
Subtotal				\$ 1,883,514		
Contingency	%	30%		\$ 565,054		
CAPITAL COST ESTIMATE TOTAL				\$ 2,448,569		
O&M COST ESTIMATE SUMMARY (see Table A.4)						
GROUNDWATER TREATMENT SYSTEM				\$ 383,558		
30 YEAR PRESENT WORTH (5%)				\$ 5,896,074		
GRAND TOTAL				\$ 8,344,643		

TABLE A.9

CAPITAL COST ESTIMATE - REMEDIATION OF LNAPL-CONTAMINATED SOILS
EXCAVATION - ALTERNATIVES 9A AND 9B
LENZ OIL SITE - LEMONT, ILLINOIS

Item	Units	Calculated Quantity	Design Quantity	Unit Price	Total Price	Calculated Quantity	Remarks	Unit Price Source
Mobilization	LS	1	1	\$ 10,000	\$ 10,000			
Surveying	LS	1	1	\$ 3,000	\$ 3,000			
Excavation								
Overburden soil	CY	21,415	21,500	\$ 50.00	\$ 1,075,000	Area of 82,600 sf - 9.7 ft depth		
Stained soil material to be treated	CY	12,237	12,500	\$ 16.33	\$ 204,125	Area of 82,600 sf - 4 ft depth		
Absorbent								
Absorbent disposal	LS	1	1	\$ 100,000	\$ 100,000	TSCA Incineration (LNAPL w/ absorbent)		Waste Management at Port Arthur, TX
Excavation dewatering								
Dewatering points and piping	EA	30	30	\$ 2,000	\$ 60,000	Pumps and controls		
Dewatering system operation	WK	37.0	40	\$ 4,000	\$ 160,000	Excavation/treatment rate of 900 cy/wk		
Dewatering storage tank	EA	1	1	\$ 71,335	\$ 71,335	125,000 gallon capacity		Modutank Inc.
Water disposal (includes trucking)	GAL	1,332,000	1,400,000	\$ 0.73	\$ 1,022,000	5 gpm for noted duration RCRA Subtitle C Treatment		Rollins Envir., Inc. at Deer Park, TX
Residential home relocation	LS	1	1	\$ 100,000	\$ 100,000			
Mobil home relocation	LS	1	1	\$ 33,600	\$ 33,600			
Shed demolition	LS	4	4	\$ 2,000	\$ 8,000			
Trucking off-site and disposal	CY	20	20	\$ 59	\$ 1,180	RCRA Subtitle D Landfill		Peoria Disposal Company at Clinton, Means A12.3-520-3150
Replace water line (includes removal)	LF	320	350	\$ 106	\$ 37,100			Means A12.3-520-3150
Replace sewer line (includes removal)	LF	320	350	\$ 106	\$ 37,100			Means A12.3-520-3150
Replace gas line (includes removal)	LF	320	350	\$ 106	\$ 37,100			Means A12.3-520-3150
Relocate power line	LS	1	1	\$ 20,000	\$ 20,000			
Relocate phone line	LS	1	1	\$ 10,000	\$ 10,000			
Road removal	CY	189	200	\$ 130	\$ 26,000	320 lf long by 24 ft wide by 8 in thick		Means 020-020-2000
Trucking off-site and disposal	CY	189	200	\$ 59	\$ 11,800	RCRA Subtitle D Landfill		Peoria Disposal Company at Clinton,
New road								
Aggregate base layer placement	CY	284	300	\$ 18.00	\$ 5,400	320 lf long by 24 ft wide by 12 in thick		Dee-N-Dee Trucking
Slab on grade with joints	SF	7,680	7,680	\$ 2.54	\$ 19,507	320 lf long by 24 ft wide by 8 in thick		Means 026-120-0100
Welded wire fabric	MSF	77	100	\$ 56	\$ 5,600	6" x 6" size		Means 025-120-0600
Curbs	LF	640	640	\$ 8.29	\$ 5,306	320 lf each side of road		Means 025-254-0300
Traffic reroute	LS	1	1	\$ 10,000	\$ 10,000			
Road repair	LS	1	1	\$ 10,000	\$ 10,000			
Temporary relocation								
Residents	WK	37	40	\$ 6,300	\$ 252,000	Work duration; 3 residents, hotel with allocations for expenses \$300/day		

TABLE A.9

CAPITAL COST ESTIMATE - REMEDIATION OF LNAPL-CONTAMINATED SOILS
EXCAVATION - ALTERNATIVES 9A AND 9B
LENZ OIL SITE - LEMONT, ILLINOIS

<i>Item</i>		<i>Calculated</i>	<i>Design</i>	<i>Unit</i>	<i>Total</i>		
	<i>Units</i>	<i>Quantity</i>	<i>Quantity</i>	<i>Price</i>	<i>Price</i>	<i>Calculated Quantity</i>	<i>Remarks</i>
							<i>Unit Price Source</i>
Lost commercial production							
Landscaper	WK	37	40	\$ 5,000	\$ 200,000		
Air monitoring with an HNu	WK	37	40	\$ 2,000	\$ 80,000		
Excavation/treatment duration	WK	37	40				
H & S equipment	WK	37	40	\$ 2,000	\$ 80,000		
Decontamination materials and labor	WK	37	40	\$ 300	\$ 5,100		
Utility pipe disposal (includes trucking)	CY	20	20	\$ 59	\$ 1,188	RCRA Subtitle D Landfill	Peoria Disposal Company at Clinton,
Decon water storage	GAL	11,100	12,000	\$ 0.10	\$ 510	300 gal per week	Baker Tank
Decon water disposal (includes trucking)	GAL	11,100	12,000	\$ 0.73	\$ 8,760	RCRA Subtitle C Treatment	Rollins Envir., Inc. at Deer Park, TX
Demobilization	LS	1	1	\$ 10,000	\$ 10,000		
TOTAL					\$ 3,720,711		

TABLE A.10

COST ESTIMATE - GROUNDWATER EXTRACTION CONTINGENCY
ALTERNATIVES 2, 5A, 9A, AND 9B
LENZ OIL SITE - LEMONT, ILLINOIS

CAPITAL COST ESTIMATE

<i>Item</i>	<i>Units</i>	<i>Calculated Quantity</i>	<i>Design Quantity</i>	<i>Unit Price</i>	<i>Total Price</i>	<i>Calculated Quantity Remarks</i>	<i>Unit Price Source</i>
Mobilization	LS	1	1	\$ 10,000	\$ 10,000		
Surveying	LS	1	1	\$ 2,000	\$ 2,000		
Piping trench	CY	356	360	\$ 16.33	\$ 5,879	1,200 ft long by 2 ft wide by 4 ft depth	Means 022-254-0500, ERM adjusted
Piping manholes	CY	11	20	\$ 13.04	\$ 261	5 manholes - 4 ft dia by 5 ft depth	Means 022-238-0500/0020/4250
Total Excavated	CY	367	380				
Extraction wells - 6 inch diameter by 20 ft deep	EA	5	5	\$ 7,000	\$ 35,000		
Extraction well cuttings, transportation, disposal	CY	4	4	\$ 59.40	\$ 238		
Sand bedding for piping	CY	89	90	\$ 12.56	\$ 1,130	1,200 ft by 2 ft wide by 1 ft depth	Dee-N-Dee Trucking
Backfilling Excavations							
Placement, compaction	CY	278	290	\$ 3.50	\$ 1,015	Total excavated less sand	Means 022-246-1050
Grading	SY	267	300	\$ 1.97	\$ 591	1,200 ft long by 2 ft wide	Means 025-122-1050
Excess excavated soil placement	CY	89	90	\$ 8.70	\$ 783	Total excavated less backfill	Means 022-216-4000 and 022-266-1150
Clean soil placed on-site							
Extraction well pumping system							
Pump vault	EA	5	5	\$ 5,000	\$ 25,000		Midwest Tile and Concrete
Piping manholes	EA	4	4	\$ 2,000	\$ 8,000		
Compressed air piping system - 2 inch	LF	1,440	1,500	\$ 9.90	\$ 14,850		Means A12.3-520-2090
Extraction pumps with controllers	EA	5	5	\$ 6,000	\$ 30,000		GeoGuard
Pump discharge piping system - 2 inch	LF	2,400	2,500	\$ 4.41	\$ 11,025		Means A12.3-520-2090
System discharge flow meters	EA	5	5	\$ 6,000	\$ 30,000		Fisher-Rosemount Magmeter
Pressure testing	LS	1	1	\$ 2,000	\$ 2,000		
Building cost							
Foundation	SF	288	290	\$ 2.32	\$ 673	Area of 12 ft by 24 ft	
Building, installed	SF	288	290	\$ 130	\$ 37,700	Area of 12 ft by 24 ft	Parkline Building
Air compressor system	EA	1	1	\$ 18,000	\$ 18,000	70 acfm - 15 hp	Quincy Compressors
Roadway crossing	LS	1	1	\$ 15,000	\$ 15,000		
Air monitoring with an HNu	WK	3	4	\$ 2,000	\$ 8,000		
HandS equipment	WK	3	4	\$ 2,000	\$ 8,000		
Decontamination materials and labor	WK	3	4	\$ 300	\$ 1,200		ERM estimate
Decon and well development water storage	GAL	2,100	2,400	\$ 0.10	\$ 240	300 gal per week plus 200 gal per week	Baker Tank
Water disposal (includes trucking)	GAL	2,100	2,400	\$ 0.73	\$ 1,752	RCRA Subtitle C Treatment	Rollins Envir., Inc. @ Deer Park, TX
Demobilization	LS	1	1	\$ 5,000	\$ 5,000		
Subtotal					\$ 273,336		
Design Engineering	%	15.00%			\$ 41,000		
Construction Management	%	25.00%			\$ 68,334		
Insurance	%	2.50%			\$ 6,833		
Permitting and Legal Fees	LS	1	1	\$ 10,000	\$ 10,000		
Subtotal					\$ 399,504		
Contingency	%	30.00%			\$ 119,851		
CAPITAL COST ESTIMATE TOTAL					\$ 519,356		
O&M COST ESTIMATE SUMMARY (see Table A.4)							
GROUNDWATER RECOVERY- 5 extraction wells					\$ 51,099		
30 YEAR PRESENT WORTH (5%)					\$ 785,493		
GRAND TOTAL					\$1,304,849		

TABLE A.11

CAPITAL COST ESTIMATE - REMEDIATION OF LNAPL-CONTAMINATED SOILS
ALTERNATIVE 9A - ON-SITE TREATMENT AND REPLACEMENT - EX-SITU SOLIDIFICATION/STABILIZATION
LENZ OIL SITE - LEMONT, ILLINOIS

<i>Item</i>	<i>Units</i>	<i>Calculated Quantity</i>	<i>Design Quantity</i>	<i>Unit Price</i>	<i>Total Price</i>	<i>Calculated Quantity</i>	<i>Remarks</i>	<i>Unit Price Source</i>
LNAPL soil and gravel					\$3,720,711	See Table A.9		See LNAPL Soil Base Cost Estimate
Rock crushing	CY	12,237	12,500	\$ 50	\$ 625,000	See Table A.9		
On-site treatment mobilization/demobilization	LS	1	1	\$ 50,000	\$ 50,000	Prepare site and obtain utilities		Millgard
Truck to on-site treatment	CY	12,237	12,500	\$ 2.99	\$ 37,375	See Table A.9		Means 022-266-0020
Ex-situ solidification/stabilization	CY	12,237	12,500	\$ 50	\$ 625,000	Solidification/ stabilization on site		Millgard
Fill placement and compaction	CY	33,652	34,000	\$ 3.10	\$ 105,400	See Table A.9		Means 022-246-1050
Fill grading	SY	9,177	9,177	\$ 1.97	\$ 18,079	Area of 82,600 sf		Means 025-122-1050
Subtotal					\$ 5,181,565			
Design Engineering					\$ 400,000			
Construction Management	%	15			\$ 777,235			
Insurance	%	2.5			\$ 129,539			
Permitting and Legal Fees	LS	1	1	\$ 20,000	\$ 20,000			
Confirmatory Sampling	LS	1	1	\$ 20,000	\$ 20,000			
Subtotal					\$ 6,528,339			
Contingency	%	30			\$ 1,958,502			
TOTAL					\$ 8,486,841			

TABLE A.12

**CAPITAL COST ESTIMATE - REMEDIATION OF LNAPL-CONTAMINATED SOILS
ALTERNATIVE 9B - LTTD
LENZ OIL SITE - LEMONT, ILLINOIS**

<i>Item</i>	<i>Units</i>	<i>Calculated Quantity</i>	<i>Design Quantity</i>	<i>Unit Price</i>	<i>Total Price</i>	<i>Calculated Quantity Remarks</i>	<i>Unit Price Source</i>
LNAPL soil base					\$3,720,711	See Table A.9	
Rock crushing	CY	12,237	12,500	\$ 50	\$ 625,000	See Table A.9	
On-site treatment mobilization/demobilization	LS	1	1	#####	\$ 900,000	Mobilize equipment, prepare site and obtain utilities 60% apportioned to LNAPL-cont. materials; reset soils > 1E-4	Soiltech ATP Systems
Truck to on-site treatment	CY	12,237	12,500	\$ 2.99	\$ 37,375	See Table A.9	Means 022-266-0020
Thermal desorption with off-gas treatment	CY	12,237	12,500	\$ 270	\$ 3,375,000	Indirect w/ off gas treat - 1,200 degrees F	Soiltech ATP Systems
Disposal of LTTD residual by incineration							
Residual storage, transportation and disposal	GAL	52,517	52,500	\$ 4.85	\$ 254,625	Average of 0.085 ft depth over area of 85,050 sf	Baker Tank
Disposal of spent carbon by incineration							
Disposal at incineration facility (includes trucking)	CY	60	60	\$ 945	\$ 56,700	TSCA and Subtitle C Incineration (soil)	Waste Management @ Port Arthur,
Fill placement, compaction	CY	33,652	34,000	\$ 3.10	\$ 105,400	See LNAPL Soil and Rock Base Cost Estimates	Means 022-246-1050
Fill grading	SY	9,177	9,177	\$ 1.97	\$ 18,079	Area of 85,050 sf	Means 025-122-1050
Seeding	AC	1.95	2	\$ 3,000	\$ 6,000	Area of 85,050 sf	
Subtotal					\$ 9,098,890		
Design Engineering					\$ 400,000		
Construction Management	%	15			\$ 1,364,833		
Insurance	%	2.5			\$ 227,472		
Permitting and Legal Fees	LS	1	1	\$ 20,000	\$ 20,000		
Confirmatory Sampling	LS	1	1	\$ 20,000	\$ 20,000		
Subtotal					\$ 11,131,195		
Contingency	%	30			<u>\$ 3,339,359</u>		
TOTAL					\$ 14,470,554		